THE WHITMAN COMPANIES, INC.

Setting the Standard in Environmental Engineering & Management

307377

THIRD AMENDED TECHNICAL MEMORANDUM FOR DEVELOPMENT AND SCREENING OF ALTERNATIVES FOR SITE REMEDIATION

FOR
ROCKAWAY BOROUGH WELL FIELD SITE
OPERABLE UNIT #3
FOR PROPERTY OF
KLOCKNER & KLOCKNER
ROCKAWAY BOROUGH, NEW JERSEY

SUBMITTED TO
USEPA-REGION II
EMERGENCY & REMEDIAL RESPONSE DIVISION
NEW YORK, NEW YORK

SUBMITTED BY
THE WHITMAN COMPANIES, INC.
ON BEHALF OF KLOCKNER & KLOCKNER

IN ACCORDANCE WITH
ADMINISTRATIVE ORDER ON CONSENT
INDEX NO. II-CERCLA-95-0104

APRIL 2006

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April 18, 2006

Chief, New Jersey Superfund Branch I
Emergency & Remedial Response Division
U.S. Environmental Protection Agency, Region II
290 Broadway, Floor 19
New York, NY 10007

Attn: Brian Quinn, Project Manager

RE: Third Amended Technical Memorandum
Klockner & Klockner
Rockaway Borough Wellfield Superfund Site
Administrative Order on Consent ("AOC")
Index No. II-CERCLA-95-0104
Whitman Project #95-03-02

Dear Mr. Quinn:

In compliance with Paragraph 34 of the above AOC, Task VIII of the Statement of Work and the U.S. Environmental Protection Agency's (EPA's) and New Jersey Department of Environmental Protection's (NJDEP) March 14, 2006 comments concerning Klockner and Klockner's October 14, 2005 Second Amended Technical Memorandum for Development and Screening of Alternatives for Site Remediation for the above referenced site, enclosed are four copies of the Third Amended Technical Memorandum for Development and Screening of Alternatives for Site Remediation (Technical Memorandum). The Technical Memorandum incorporates EPA's and NJDEP's March 14, 2006 comments. Responses to each comment are presented below.

The following are responses to the agencies' General Comments:

- EPA General Comment –"*A figure should be included that incorporates the depth to groundwater information in Attachment 1 to delineate the depth to groundwater . . .*" Attachment 2 in the technical memorandum provides additional information on the depth to groundwater. However, there appears to be an inconsistency in the information. Specifically, the plan view provided in Figure A1 indicates depths to groundwater ranging from 11.51 feet below ground surface (bgs) (at P-1) to 14.42 feet bgs (at MW-1S). However, Figures A2 and A3 indicate lowest depth to groundwater of 13.5 feet bgs and 14.23 feet bgs, respectively.

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<u>Response:</u> The depth to ground water varies due to local topographic relief of the property. The lowest depth to ground water in MW-4S, MW-7S, P-1 and FG-1 were measured on November 16, 1990 while those for the other wells were measured on December 14, 1988. The 1988 water depths were lower than those of 1990. A review of the actual water elevations with respect to mean sea level for the 1988 measurements indicates the elevation of the ground water ranges from 509.38 to 509.74 feet above mean sea level (amsl). The difference in elevation is less than 0.4 feet and the average elevation for MW-1S, MW-2S, MW-3S, MW-5S, and MW-6S on the Building 12 property in 1988 was 509.55 feet. The average depth to ground water measured from these same wells in 1988 was 13.57 feet. Figure A2 is a cross section running through the Alleyway at the Building 12 property. Monitoring well MW-2S is located in this area. The lowest depth to ground water in this area was measured at 13.46 feet below grade and 509.54 feet amsl. For ease of representation, the average ground water elevation and depth below grade for the Building 12 property are used on Figure A2. The depth of the area to be addressed by the Klockner & Klockner Feasibility Study on the Building 12 Property is the area above 509.55 feet amsl. The lowest water elevation for the Building 13 property was measured on November 16, 1990 at 510.43 feet amsl with a corresponding depth below grade of 14.23 feet. This is the lowest depth and elevation of ground water depicted on Figure A3 for the Building 13 property.

Section 2.2 and Figures A2 and A3 have been revised to indicate the above information.

- EPA Comment 16 -"*The lead alternatives should be numbered and distinguishable from the PCE/TCE alternatives.*" Although the technical memo does discuss PCE/TCE and lead separately within each alternative, separate alternatives should provide more flexibility in the selection of remedial alternatives for these two distinct contaminant groups.

  <u>Response:</u> The PCE/TCE and lead alternatives have been separated in Section 6.

- NJDEP Comment 5b -"*Table 1 includes a Federal Standard (*EPA) *for lead. The source of Federal Standards should be discussed in this section, as were the New Jersey Soil Cleanup Criteria (NJSCC), the Federal Standards should be discussed as well.*" The technical memo indicates (on p. 6) that a list of Federal and State ARARs were analyzed to determine the cleanup criteria for the Site. The list of ARARs/TBCs analyzed in the technical memo should be provided.

  <u>Response:</u> A list of ARARs/TBC is provided in Attachment 3.

The following are responses to the agencies' Specific Comments:

1. P.11, §5.2.4 - "GRP" should be "GRA."

   Response: Corrected.

2. P. 13, Table 2 -The purpose of this table is to screen technologies/process options for feasibility based on site conditions or contaminants. A clay and soil cap would be technically feasible. The screening comment would be more appropriate on Table 4.

   Response: Tables 2 and 4 have been revised as requested.

3. P. 13, Table 2 -The difficulty of excavating inside the building should be discussed under excavation, rather than on-site incineration (and a number of other treatment technologies on Table 2). "Over kill" is not necessarily an appropriate rationale for eliminating on-site incineration. It would be more appropriate to eliminate this technology based on implementability and cost issues in the evaluation of technologies and process options presented in Table 4.

   Response: The difficulty of excavation inside the building has been moved to the discussion on excavation as it is still a key component affecting incineration as well as other ex-situ Remedial Technologies. Incineration was rejected from further evaluation under Preliminary Screening as it is clearly not an appropriate Remedial Technology for the Site: (i) the quantity of contaminated soil present at the Site is relatively small compared to the quantities appropriate for incineration to be cost effective, (ii) incineration is expensive, (iii) there is not sufficient room on the Klockner property for the staging of soil and the incineration equipment, and (iv) permitting for an incinerator in the mixed residential industrial area would be difficult. Therefore, incineration is rejected at the Preliminary Screening level.

4. P. 14, Table 2 -The screening comment for biodegradation should also indicate that PCE/TCE do not readily degrade under aerobic conditions, as discussed under bioventing.

   Response: Table 2 has been revised as requested.

5. P. 20, §5.5 -The implementability evaluation should not discuss whether a technology/process option is "ineffective."

   Response: This section has been revised as requested.

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6. P. 20, §5.5.1 and P. 21, §5.5.2 -The lists of technologies/process options are not consistent, as process options are only provided under the treatment technology.

   Response: This section has been revised as requested.

7. P. 22, Table 4 -The evaluation of excavation is not consistent. In Table 4, the difficulty of excavating beneath the buildings is discussed; however, the excavation alternatives developed later don't include discussion of excavation beneath the active buildings.

   Response: The excavation alternatives developed in Section 6 have been updated to include the difficulty of excavating beneath the active buildings.

8. P. 22, Table 4 -For soil vapor extraction, steam injection, hot air injection, etc., it should be noted that the maintenance costs are only for a very short period of time, as these remedies are typically only implemented for a short duration, e.g., one to three years.

   Response: Table 4 has been revised to include the requested information.

9. P. 24, Table 5 -Remedial technologies from Table 4 should be included in the remedial technology column on Table 5.

   Response: Klockner does not agree with this comment. The remedial technologies identified in Table 4 are those that are applicable and have passed the Preliminary Screening for TCE and PCE remediation while those listed in Table 5 are applicable and have passed the Preliminary Screening for Lead.

10. P. 24, Table 5 -The comparison in Table 5 should identify relative differences between technologies and process options. For example, asphalt and concrete caps may be more easily implemented than multi-media caps.

    Response: Table 5 has been revised to include the requested information.

11. P. 24, Table 5 -The cost evaluation should differentiate hazardous and non-hazardous soil disposal.

    Response: Table 5 has been revised as requested.

12. P. 25, §5.6.1.3 -The No Action alternative will allow potential exposures to persist. It will not "expose humans and the environment...".

    Response: This section has been revised as requested.

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13. P. 26, §5.6.1.4 -Please clarify why the indicated data are needed for the No Action alternative. The current contaminant delineation is presumably adequate to define the Site conditions.

    Response: This section has been revised to indicate that no further data is required.

14. P. 26, §5.6.1.5 -No Action should be considered appropriate when there is a low potential for "exposure" rather than migration.

    Response: This section has been revised as requested.

15. P. 26, §5.6.1. 7 -"GRA" should be "alternative."

    Response: Corrected.

16. P. 27, §5.6.2.4 -Please clarify why the indicated data are required for institutional controls.

    Response: The information is needed to identify the site conditions and for identification in a deed notice or other institutional control. This section has been revised to indicate this.

17. P. 28, §5.6.3.3 -This section discusses caps in conjunction with vertical barriers. However, vertical barriers were screened from further consideration.

    Response: The reference to vertical barriers has been removed.

18. P. 29, §5.6.3.6 -This section indicates no excavation is required for capping, but the evaluation of multi-media capping in Table 5 indicates excavation would be performed.

    Response: This section has been revised to indicate the excavation requirements for clay and soil, and multi media caps. In addition, section 5.6.3.3 Limitations has been updated to include information concerning the installation of clay and soil, and multi media caps. Also, section 5.6.3.7 Results of Evaluation has been updated to identify which type of caps are being retained for further evaluation.

19. P. 29, §5.6.4.1 -O&M of the facility may last for the life of the disposal facility, but this is not a concern for the entity disposing of the soil, nor does it result in any long-term costs.

    Response: The reference to O&M has been removed from this section.

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20. P. 31, §5.6.5 -Please clarify why air injection to treat the saturated zone is discussed, since the saturated zone is being addressed by Alliant Techsystems, Inc. as discussed on Page 3.

    Response: The different uses of air injection were named to identify how it can be used. The reference to injection into the saturated zone has been removed from this section.

21. P. 37, §5.6.7.1- This section discusses addition of oxygen, but aerobic degradation is not a likely mechanism for the PCE/TCE.

    Response: Section 5.6.7.1 mentions the addition of oxygen or other electron acceptors. Section 5.6.7.2 Applicability has been revised to indicate that, although TCE and PCE are amendable to aerobic biodegradation (through cometabolic pathways), it is not the preferred pathway. Also, Section 5.6.7.3 Limitations has been revised to indicate that anaerobic conditions would have to be created for TCE and PCE.

22. P. 39, §5.6.8.1- Is there specific relevance to remediation of dry cleaning facilities in the State of Florida?

    Response: The relevance was to identify the fact that remedial activities conducted at other sites have shown the potential to remediate TCE and PCE through chemical oxidation with ozone. This information has been revised in Section 5.6.8.1 to be more generic.

23. P. 40, §5.6.8.3 -Are there any concerns with implementing in situ chemical oxidation beneath buildings, e.g., potential for generating toxic gases?

    Response: Concern is primarily with the potential for ozone to migrate into the occupied space above the building floor. This would require an ozone capture/destruction system as well as above grade monitoring. Section 5.6.8.3 has been revised to include this concern. Other limitations associated with chemical oxidation have also been added to Section 5.6.8.3.

24. P. 40, §5.6.8.5 -This discussion is very general, and does not address site-specific conditions adequately, e.g., resistance of site-specific chemicals to oxidation.

    Response: This section has been revised to include information concerning the effectiveness on site-specific chemicals (TCE, PCE).

25. P. 41, §5.6.8.7 -Chemical oxidation was eliminated based on the limitations presented in an earlier section; however, none of the limitations discussed appear to apply to this site to an extent that this technology could not be implemented.

Response: Section has been revised to eliminate chemical oxidation using aqueous delivery methods and to retain chemical oxidation using ozone.

26. P. 41, Tables 6 and 7 -A multi-media cap is not included on these tables, and was not previously eliminated from consideration.

    Response: The multi media cap has been eliminated in Section 5.6.3.7.

27. P. 42, §6.1 -"They remedial alternatives..." should read "The remedial alternatives...".

    Response: Corrected.

28. P. 42, §6.1.1 -This heading is redundant.

    Response: The heading for Section 6.1 has been changed to "Introduction".

29. P. 42, §6.1.1 -A multi-media cap was not eliminated from consideration, but is not included in the alternatives.

    Response: The multi media cap has been eliminated in Section 5.6.3.7.

30. P. 44, §6.1.1.2 -The discussion of time frame for this alternative should indicate that contaminants will remain for at least as long as under the No Action alternative, perhaps longer since infiltration will be reduced. ".

    Response: This section has been revised as requested.

31. P. 45, §6.1.1.3 -"...limited amount of capital or operating and maintenance cost..." should be clarified. Also, the last sentence of this paragraph is not clear -cost would not be for "... continued operation and maintenance of TCE and PCE...".

    Response: The statement "...limited amount of capital or operating and maintenance cost..." has been revised to indicate "...low to moderate amount of capital or operating and maintenance cost..." as this alternative will involve soil excavation and off-site transportation and long term maintenance. The referenced unclear sentence has been revised.

32. P. 47, §6.1.1.4 -Under cost evaluation, the last sentence of this paragraph is not clear --cost would not be for "...continued operation and maintenance of TCE and PCE...".

    Response: The unclear sentence has been revised.

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33. Figure 3 -Note refers to results in bold, but boldface was not used.

    Response: This has been revised to indicate results in color.

34. Figure 4 -same as previous comment.

    Response: This has been revised to indicate results in color.

35. Figure 5 -It would be helpful to depict the locations of the building on the cross-sections. Also, the rationale for the elimination of sample SSAW-1 should be considered and discussed further. Excavation volumes and/or volumes to be treated could be substantially impacted if contamination extends deeper into the soil column.

    Response: The location of the building has been added to the cross sections as requested. The sample result at SSAW-1 from a depth of 13-13.5 feet below grade appears to be an anomaly. The concentration of TCE detected (1.33 mg/kg) was just above its Remedial Action Goal of 1 mg/kg. The results for sampling in this area indicate that the TCE soil contamination is present above the Remedial Action Goal in the shallow (first 5 to 7 feet of soil below grade) soil which consists of a silty sand and gravel layer. Other deeper sample locations in this area indicated the significant drop off (1 to 2 orders of magnitude or to none detected) in TCE concentrations with depth. Pre-remediation sampling will be conducted from this area to further investigate this anomaly. Section 4.3.1 has been revised to include this information.

36. Figure 6 -same as Comment 35, relative to sample SSSP-1.

    Response: The location of the building has been added to the cross sections as requested in Item 35 above. Sample SSSP-1 was collected from below the base of a sump located adjacent to the building wall from a depth of 4-4.5 feet below grade. Based on the contaminant trends observed in other samples in this area, it is expected that the concentration of TCE beneath 4.5 feet at SSSP-1 drops to below the Remedial Action Goal within several feet. The contamination is anticipated to be limited to a small horizontal area below the sump. Pre-remediation soil sampling will be conducted to further investigate this area. Section 4.3.1 has been revised to include this information.

37. Figure 9 -Note refers to results in bold, but boldface was not used.

    Response: This has been revised to indicate results in color.

38. Figure 9 -The lead results appear to indicate that contamination extends off-site. This was not discussed in the text. If the contamination extends off-site, consent from the off-site property owner is needed for a deed notice. This issue should be discussed as part of the implementability evaluation of the lead alternatives.

    Response: The Lead contamination was present above the Remedial Action Objective on the Klockner side of the property boundary and was below the Remedial Action Goal on the neighboring property in the same area. It is not likely that the contamination extends onto the neighbors property, but the potential for this occurring has been added to the implementability evaluations in Table 5. Section 4.3.2 has been revised to include this information.

If you have any questions or comments concerning the above responses or the enclosed Technical Memorandum, please contact me at (732) 390-5858.

Very truly yours,

Michael N. Metlitz
Senior Project Manager

MNM/
Enclosure
cc: Frances Zizila, Assistant Regional Counsel, EPA
Dan Klockner, Klockner & Klockner
Marilynn Greenberg, Esq., Riker, Danzig, Scherer, Hyland & Perretti
Donna Gaffigan, NJDEP

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THIRD AMENDED TECHNICAL MEMORANDUM FOR DEVELOPMENT AND SCREENING OF ALTERNATIVES FOR SITE REMEDIATION ROCKAWAY BOROUGH WELL FIELD SITE OPERABLE UNIT #3 FOR PROPERTY OF KLOCKNER & KLOCKNER ROCKAWAY BOROUGH, NEW JERSEY

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THIRD AMENDED TECHNICAL MEMORANDUM FOR DEVELOPMENT AND SCREENING OF ALTERNATIVES FOR SITE REMEDIATION ROCKAWAY BOROUGH WELL FIELD SITE OPERABLE UNIT #3 FOR PROPERTY OF KLOCKNER & KLOCKNER ROCKAWAY BOROUGH, NEW JERSEY

1.0 INTRODUCTION

This Third Amended Technical Memorandum for Development and Screening of Alternatives for Site Remediation (TMDSASR) has been prepared by The Whitman Companies, Inc. (Whitman) on behalf of Klockner & Klockner (Klockner) in accordance with Chapter VIII, Paragraph 34 of the Administrative Order on Consent (AOC) entered into by Klockner and the United States Environmental Protection Agency (EPA), and Task VIII of the Statement of Work (SOW) (USEPA, 1995). This Third Amended TMDSASR incorporates EPA's and New Jersey Department of Environmental Protection's (NJDEP's) March 14, 2006 comments (Attachment 1) on Klockner's October 14, 2005 Second Amended TMDSASR.

1.1 Purpose of Report

The purpose of this Third Amended TMDSASR is to:

- Describe the process employed in the development of the remedial action objectives, screening of general response actions, remedial technologies and process options for the Rockaway Borough Wellfield Site (Site) - Operable Unit Number 3 (OU3) at Block 5, Lots 1 and 6, and Block 7, Lots 7 and 8, in the Borough of Rockaway (Klockner Property). OU3 consists of the soil component of the response activities associated with source areas contributing to ground water contamination at the Site.

- Identify and screen the general response actions, remedial technologies, and process options available for the development of remedial alternatives for soil contamination due to the presence of Trichloroethylene (TCE), Tetrachloroethylene (PCE) and lead.

- Identify remedial technologies and process options to retain for the development of remedial alternatives for soil contamination based on effectiveness, implementability and cost.

- Assemble remedial alternatives from the retained remedial technologies for use in the Feasibility Study for the contaminated soils at OU3.

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1.2 Report Organization

The Third Amended TMDSASR is organized as follows:

- Section 1 - Introduction
- Section 2 – Site background
- Section 3 – CERCLA criteria used to evaluate remediation alternatives
- Section 4 – Development of Remedial Action Objectives
- Section 5 – Development and screening of remedial technologies and process options
- Section 6 – Development of remedial alternatives
- Section 7 – Conclusions
- Section 8 – References

2.0 SITE BACKGROUND

2.1 Klockner Property Location

The Klockner Property is located at the intersection of Stickle Avenue and Elm Street in the north end of the Borough of Rockaway in Morris County, New Jersey. The Klockner Property is a portion of the-Site, which itself encompasses approximately 2.1 square miles. The Rockaway Borough well field is located approximately 600 feet southwest of the Klockner Property. See Figure 1 for the Klockner Property location on a U.S.G.S. Dover, N.J. quadrangle. A site map of the Klockner Property is included as Figure 2.

The Klockner Property consists of two separate properties. The first property is located north of Stickle Avenue and is currently owned by Klockner. This portion of the Klockner Property consists of Block 5, Lots 1 and 6, and is referred to as the "Building 12 Property."

The second portion of the Klockner Property is located south of Stickle Avenue and consists of Block 7, Lots 7 and 8, and is referred to as the "Building 13 Property." Lot 7 is currently owned by Norman Iverson and operated by F.G. Clover Co. Lot 8 is currently owned by Klockner and is used as parking for Building 12 Property tenants.

The Building 12 Property consists of 1.34 acres. The majority (approximately 93%) of the Building 12 Property is covered by building structures and pavement. The building structures consist of approximately 50,000 square feet of one and two story space used for manufacturing, office space and storage. The Building 12 Property is bordered to the south by Stickle Avenue, to the east by Oak Street and residential housing, to the north by Ford Road and to the west by Elm Street.

Lot 7 of the Building 13 Property consists of approximately 1.07 acres, and Lot 8 consists of approximately 0.5 acres. There are two building structures present on Lot 7 of the Building 13 Property. The building coverage of the Building 13 Property is approximately 12,400 square feet. Approximately 50% of the Building 13 Property is covered by building structures and pavement. Lot 8 is a partially paved area with no structures. The Building 13 Property is bordered to the north by Stickle Avenue, to the west by Elm Street, to the south by residential property and to the east by a railroad line.

2.2 Site History

The Site is a municipal well field that serves approximately 10,000 people. The Rockaway Borough's three water supply wells (#1, 5 and 6) draw water from an unconsolidated glacial aquifer from a depth ranging from 54 to 84 feet below grade. The supply wells are located off of Union Street and are southwest of the Klockner Property.

Contamination of the groundwater at the Site was first discovered in 1979. The primary contaminants identified were TCE and PCE. Several inorganic contaminants, including chromium, lead and nickel, also were identified. The Site was placed on the EPA's National Priorities List of Superfund sites in December 1982.

Following discovery of ground water contamination at the Site, the NJDEP conducted an RI/FS (SAIC, 1986), which was known as Operable Unit 1 (OU1), and EPA conducted a second RI/FS (ICF, 1991a and b), which was known as Operable Unit 2 (OU2). Through these studies, the Klockner Property was identified as one of the potential source areas of the Site contamination and was designated as the Operable Unit #3 by EPA.

The investigation of soil and ground water contamination was initiated at the Building 12 portion of the Klockner Property in 1986 under New Jersey's Environmental Cleanup Responsibility Act (ECRA). The ECRA investigation was conducted under oversight of the NJDEP. Soil and ground water contamination were detected, consisting primarily of chlorinated volatile organic compounds. Klockner withdrew from the ECRA program in 1990 but continued to investigate the source of TCE and PCE contamination in soil through January 1992.

Alliant Techsystems Inc. (previously Thiokol Corp. then Cordant Technologies, Inc.) is addressing the groundwater contamination originating from the Klockner Property area and saturated zone pursuant to a 1994 Consent Decree entered into between Thiokol and EPA. Under the 1995 AOC and SOW, Klockner agreed to conduct an RI/FS addressing the source(s) of the ground water contamination present in the unsaturated zone at the Klockner Property. The unsaturated zone was identified as the area above the water table as defined by the lowest water level measurements in the Site monitoring wells on or before January 16, 1991 (Attachment 2). The lowest water level measurements are identified on Figures A1, A2 and A3 in Attachment 2. The depth to ground water varies due to local topographic relief of the property. The lowest depth to ground water in MW-4S, MW-7S, P-1 and FG-1 were measured on November 16, 1990 while those for the other wells were measured on December 14, 1988. The 1988 water depths were lower than the 1990 water depths. A review of the actual water elevations with respect to mean sea level for the 1988 measurements indicates the elevation of the ground water ranges from 509.38 to 509.74 feet above mean sea level (amsl). The difference in elevation is less than 0.4 feet and the average elevation for MW-1S, MW-2S, MW-3S, MW-5S, and MW-6S on the Building 12 property in 1988 was 509.55 feet. The average depth to ground water measured from these same wells in 1988 was 13.57 feet. Figure A2 is a cross section running through the Alleyway at the Building 12 property. Monitoring well MW-2S is located in this area. The lowest depth to ground water in this area was measured at 13.46 feet below grade and 509.54 feet amsl. For ease of representation, the average ground water elevation and depth below grade for the Building 12 property are used on Figure A2. The depth of the area to be addressed by the Klockner & Klockner Feasibility Study on the Building 12 Property is the area above 509.55 feet amsl. The lowest water elevation for the Building 13 property was measured on November 16, 1990 at 510.43 feet amsl with a corresponding depth below grade of 14.23 feet. This is the lowest depth and elevation of ground water depicted on Figure A3 for the Building 13 property.

The remedial investigation activities conducted at the Klockner Property by Klockner were reported in the May 2004 Final Remedial Investigation Report.

2.3 Development and Screening of Alternatives for Site Remediation

The development and screening of alternatives for site remediation is conducted in accordance with the requirements of the EPA document Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA.

3.0 CERCLA CRITERIA USED TO EVALUATE REMEDIATION ALTERNATIVES

The nine evaluation criteria employed for the selection of the remedial alternatives include:

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Category		Criteria
Threshold Criteria	1.	To provide protection of human health and the environment
	2.	Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
Balancing Criteria	3.	Offer Long term effectiveness
	4.	Evaluation of how the remedy acts to reduce the toxicity, mobility, and volume of the contamination
	5.	Short term effectiveness
	6.	Implementability
	7.	Cost Effectiveness
Regulatory Agency and Community Criteria	8.	Assessment of state acceptance
	9.	Community acceptance

4.0 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

4.1 Cleanup Criteria for TCE, PCE and Lead

Soil is the only media being evaluated under this Third Amended TMDSASR. The soil contaminants of concern and proposed cleanup criteria are presented below.

4.1.1 Contaminants of Concern Identified on Subject Site

The contaminants of concern identified in the soil at the Klockner Property include:

- Trichloroethylene (TCE)
- Perchloroethylene (PCE)
- Lead

The highest concentration of lead detected in soil was 841 mg/kg at a depth of 0-0.5 feet. The highest concentration of TCE detected in soil was 90 mg/kg at a depth of 1-1.5 feet. The highest concentration of PCE detected in soil was 23.7 mg/kg at a depth of 2-2.5 feet in the Quonset Hut location of the Klockner Property.

4.1.2 Remedial Action Objectives

The following provides information concerning: (i) the nature and extent of contamination, (ii) Applicable or Relevant and Appropriate Requirements (ARARs), and (iii) EPA and New Jersey State cleanup criteria/standards. The Remedial Action Objectives (RAOs) for the Klockner Property are then developed based on this information.

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The Risk Assessment conducted by EPA and included in the May 2004 Final Remedial Investigation Report indicated that the lead, TCE and PCE concentrations present in the soils at the Klockner Property were not a concern with respect to the current property use. The summary section of the EPA's Risk Assessment is provided below:

> *The results of the hazard and risk calculations for the Klockner and Klockner property indicate that the current noncancer hazards and cancer risks for an adult worker and adolescent intermittent visitor from soil exposure are below or within EPA's acceptable values. This assessment only accounted for the hazards and risks associated with soil exposure, so the actual risk at the site may be higher when other contaminated medium are included. The potential future uses of the site as a recreational park visitor yielded hazards and risks for an adult and child population for soil exposure that were below or within EPA's acceptable values. Another potential, although unlikely, future use as a residential area indicated that the hazards and risks for an adult resident were below or within EPA's acceptable values. However, the noncancer hazard for a child resident, driven by trichloroethene and iron, exceeded EPA's acceptable value. The concentrations of trichloroethene and tetrachloroethene detected in the soil exceed New Jersey's criteria for soil contamination due to potential to contaminate groundwater. Thus, even though the hazards and risks for soil exposure are below or within acceptable EPA values, a remedial action may still be warranted.*

The purpose of ARARs is to ensure that response actions are consistent with other pertinent federal and state requirements for public health and environmental protection that legally would be required or applicable in sufficiently similar circumstances to those encountered at hazardous waste sites. In addition, the Superfund Amendments and Reauthorization Act (SARA) requires that State ARARs be considered during the assembly of remedial alternatives if they are more stringent than Federal requirements. EPA also has indicated that "other" criteria, advisories, and guidelines must be considered in evaluating remedial alternatives. ARARs are categorized, using current EPA practice, as contaminant-specific, location-specific, and action-specific.

Potential Federal and State of New Jersey ARARs and criteria "to be considered" (TBC) for the site were analyzed and considered to determine the cleanup criteria for the Site. A list of these ARARs and TBC is included in Attachment 3.

NJDEP's May 12, 1999 Soil Cleanup Criteria (NJSCC) guidance document contains guidance criteria that are TBC. The NJSCC include: impact to ground water soil cleanup criteria (NJIGWSCC), residential direct contact soil cleanup criteria (NJRDCSCC) and nonresidential direct contact soil cleanup criteria (NJNRDCSCC). These three types of soil cleanup criteria are

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TBC when evaluating remedial alternatives for the Klockner Property. NJDEP requires remediation of soil contamination that exceeds the unrestricted use criteria, which is defined as the lowest of any numeric standard, without limitation, any residential soil remediation standard, any non-residential soil remediation standard and any applicable impact-to-ground water soil standard. The most predominant contaminants detected in the soil at the Klockner Property above the most stringent NJSCC included TCE, PCE and lead as summarized below. The Proposed Cleanup Concentrations identified in Table 1 are the most stringent of the ARARs and TBC and are used to identify the RAO. For lead, NJDEP has not published an NJIGWSCC, only NJNRDCSCC and NJRDCSCC. The lead soil contamination is limited in extent and does not appear to be impacting ground water. Therefore, the Proposed Cleanup Concentration for lead is its NJRDCSCC.

Table 1
Relevant Cleanup Levels for Site Contaminants

Contaminant	NJIGWSCC	NJRDCSCC	Proposed Cleanup Concentration	Maximum Concentration Found
TCE	1 mg/kg	23 mg/kg, residential	1 mg/kg for impact to ground water	90 mg/kg
PCE	1 mg/kg	4 mg/kg, residential	1 mg/kg for impact to ground water	23.7 mg/kg
Lead	No Standard	400 mg/kg	400 mg/kg for residential per NJRDCSCC	841 mg/kg

Based on the above information, the RAOs identified for the Klockner Property are as follows:

1. Remediation of the Chlorinated Volatile Organic Compounds (CVOC) soil contamination to achieve the NJIGWSCC to remove the potential continuing source of ground water contamination.

2. Remediation of the lead soil contamination to achieve the NJRDCSCC to remove direct contact exposure.

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4.2 Media to Which Remedial Action Applies

Based on the 1995 AOC between EPA and Klockner & Klockner, this Second Amended TMDSASR is focused on the remedial actions that apply to soil media above the water table. The ground water remediation is being addressed by Alliant Techsystems, Inc.

4.3 Identification of Volumes or Areas of Media

Volumes and location of soil to which remedial action applies is as follows:

4.3.1 TCE and PCE Contamination

Building 12 Property:

The primary CVOC detected above its Proposed Cleanup Concentration (NJIGWSCC of 1 mg/kg) at the Building 12 Property was TCE. Except for the North Drum Storage Area, the other areas where CVOCs were detected were further investigated as part of the Alleyway Area. The sampling activities conducted have delineated the vertical and horizontal extent of the CVOC soil contamination at the Building 12 Property. The CVOC soil contamination generally extends to a depth of less than 5 to 7 feet. The TCE contaminated area exceeding the Proposed Cleanup Concentration is irregularly shaped and is approximately 215 feet across its north-south axis and varies in width from approximately 50 feet to 155 feet from east to west. The estimated quantity of soil exceeding the Proposed Cleanup Concentration for TCE is approximately 4,090 cubic yards. The approximate horizontal and vertical extent of the TCE soil contamination with respect to the Proposed Cleanup Concentration is included in Figures 3, 5 and 6. A review of the cross-sections for TCE soil contamination indicates two anomalies with respect to the TCE contaminant contours. The sample result at location SSAW-1 from a depth of 13-13.5 feet below grade appears to be an anomaly. The concentration of TCE detected (1.33 mg/kg) was just above its Proposed Cleanup Concentration of 1 mg/kg. The results for sampling in this area indicate that the TCE soil contamination is present above the Proposed Cleanup Concentration in the shallow (first 5 to 7 feet of soil below grade) soil which consists of a silty sand and gravel layer. Other deeper sample locations in this area indicated the significant drop off (1 to 2 orders of magnitude or to none detected) in TCE concentrations with depth. Pre-remediation sampling will be conducted from this area to further investigate this anomaly. Sample SSSP-1 was collected from below the base of a sump located adjacent to the building wall from a depth of 4-4.5 feet below grade. Based on the contaminant trends observed in other samples in this area, it is expected that the concentration of TCE beneath 4.5 feet at SSSP-1 drops to below the Proposed Cleanup Concentration within several feet. The contamination is anticipated to be limited to a small horizontal area below the sump. Pre-remediation soil sampling will be conducted to further investigate this area.

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PCE was detected in the soil samples collected at the Quonset Hut, Sump and southwestern portion of the area between the Alleyway and Degreaser Pit. Based on comparison to the TCE concentrations throughout these areas, PCE is considered a secondary contaminant. The PCE contaminated areas exceeding the Proposed Cleanup Concentration (NJIGWSCC of 1 mg/kg) are irregular in shape and are approximately 3,375 square feet by 5 feet deep (625 cubic yards) (Quonset Hut/Sump) and approximately 4,200 square feet by 5 feet deep (778 cubic yards) (Southwestern Portion). The quantitation limits (range from 1.46 to 3.07 mg/kg) for some of the samples collected in the Scale Room and the area between the Alleyway and Degreaser Pit (Samples SSSR-2, SSSR-3, SSAW-2, SSAW-3, SSAW-4, SSAW-9, SSAW-10) were just above the Proposed Cleanup Concentration. The TCE concentrations in the noted samples all exceeded 19 mg/kg, identifying the areas for remedial activities. The higher TCE concentrations resulted in the need for the laboratory to dilute the affected samples. Such a dilution resulted in the increase of the quantitation limits for PCE to above 1 mg/kg. Therefore, if the PCE was present above 1 mg/kg and less than the quantitation limit, it is highly likely that it would have been detected below the quantitation limit and reported as such. Therefore, the fact that the quantitation limits for the PCE in the affected samples were just above its Proposed Cleanup Concentration is not a concern with respect to defining the extent of PCE contamination or identifying remedial activities for the Site. The vertical and horizontal extent of the PCE affected areas has been delineated. The approximate horizontal and vertical extent of the PCE soil contamination with respect to the Proposed Cleanup Concentration is included in Figures 10, 11 and 12.

Building 13 Property:

The results of the sampling activities identified one (1) area where PCE soil contamination was detected above its Proposed Cleanup Concentration (NJIGWSCC of 1 mg/kg). This area is identified as the Fence Area. The highest PCE concentration detected in this area was 4.28 mg/kg. The PCE contamination has been delineated both horizontally and vertically (Figures 7 and 8) in this area, and covers an area of approximately 40 feet by 20 feet by less than 5 feet deep (150 cubic yards).

4.3.2 Lead Contamination

Building 12 Property:

Site investigation studies show that the lead contamination is confined to an area of 20'x 18' along the Northeast property boundary line of the Building 12 Property.

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Lead contamination was detected above the Proposed Cleanup Concentration (NJRDCSCC of 400 mg/kg) at the former Drum Storage Shed Area located just northeast of the Alleyway. The sampling activities conducted have vertically and horizontally delineated the lead concentrations below the Proposed Cleanup Concentration (Figure 9). The Lead contamination was present above the Proposed Cleanup Concentration on the Klockner side of the property boundary (Sample SSFS-3A at 841 mg/kg) and was below the Proposed Cleanup Concentration in the delineation sample (Sample SSFS-7A at 145 mg/kg) just over the property boundary on the neighbor's side. It is not likely that the contamination extends onto the neighbors property. At the most, the area of lead concentrations exceeding the Proposed Cleanup Concentration is 20 feet by 18 feet by 2 feet deep (27 cubic yards).

5.0 DEVELOPMENT AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

5.1 Introduction

Process options are remedial technologies and/or techniques that can be used either individually or in combination to control risks to human health and the environment and satisfy the RAOs unique to each contaminated site. Remedial technologies are organized under General Response Actions (GRAs), i.e. containment, treatment, disposal. The initial list of remedial technologies and process options considered in the Final Remedial Investigation Report was developed by Klockner.

This section identifies and screens the remedial technologies and process options applicable to the soil contamination at the Klockner Property that could potentially be used to achieve the RAOs. A preliminary screening of technologies and process options was conducted based on technical implementability to eliminate infeasible or impractical options given the site-specific conditions. Those technologies that passed the initial screening were further analyzed based on effectiveness, implementability and cost as presented in Section 5.4. Section 6.0 assembles the surviving process options into remedial alternatives deemed capable of achieving the remedial action objectives.

5.2 General Response Actions

GRAs for remediation of a site may include excavation, containment, treatment, extraction, disposal, institutional actions or a combination of these. Based on the RAOs, site conditions, volumes of soil requiring remediation, and information on the remediation of CVOCs and lead in soils, GRAs were identified for the soil contamination present at the Klockner Property.

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GRAs are those actions that will satisfy the RAOs for the contaminated media at a site by reducing the concentration of contaminants of concern or reducing the potential for contact with the contaminants of concern.

The appropriate GRAs identified for addressing the soil contamination at the Klockner Property include:

- No action
- Institutional controls
- Containment
- Removal
- Treatment
- Disposal

Each of the GRAs was investigated and screened for specific remedial technologies and process options. A brief description of the GRAs is presented below.

5.2.1 No Action

Evaluation of the no action alternative is required by EPA as it provides a baseline against which impacts of other GRAs can be compared. There would be no active remediation conducted to reduce the toxicity and volume of contamination. The current contamination present at the site would continue unabated.

5.2.2 Institutional Controls

Institutional controls are designed to reduce exposure to toxic chemicals and protect human health by restricting land use. The most common institutional control is a restrictive covenant in the form of a deed notice. Institutional controls typically identify the location of the contaminants, what restrictions are present at the site, requirements for notices to current or perspective owners or tenants, maintenance requirements and monitoring. Long term monitoring would fall under this GRA. This GRA does not reduce the concentration or volume of the contaminants. Institutional controls may be appropriate when combined with other GRAs, i.e. containment.

5.2.3 Containment

Containment is designed to prevent human and environmental receptor exposure to contaminated material using physical barriers. Common containment options include capping of contaminated areas. Containment is used to isolate the contaminated media and restrict migration of contaminants. Containment does not reduce the concentration or volume of contaminants.

5.2.4 Removal

Removal involves the excavation/extraction of contaminated media from the ground. Following excavation/extraction, the area is restored. Removal is typically used in conjunction with other GRAs, i.e. disposal, to meet the RAOs for the site. This GRA does not reduce the contaminant concentration but transfers the contaminants for further remediation under another GRA.

5.2.5 Treatment

Treatment involves the destruction of contaminants, transfer of contaminants to another media or alteration of the contaminant so it is innocuous. Treatment technologies include thermal, chemical, physical, biological and/or a combination of these technologies. The treatment technologies include in-situ and ex-situ options. If feasible, the treatment GRA is usually preferred. A presumptive remedy for VOCs under appropriate conditions is soil vapor extraction.

5.2.6 Disposal

Disposal involves the transfer of contaminated media, concentrated contaminants or other related materials to a site permitted for treatment or long term storage.

5.3 Treatment Location

The following are the possible ex-situ treatment locations for excavated material.

- Building 12 parking lot
- Building 13 parking lot

5.4 Preliminary Screening of Technologies and Process Options

For each GRA there are various remedial technologies that are used to conduct the remediation. The term remedial technology refers to general categories of technology types, such as physical/chemical, capping, or excavation. Each remedial technology may have several process options, which refer to the specific material, method or equipment used to implement a technology.

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During this screening step, process options and entire technology types were eliminated from further consideration on the basis of technical implementability. The factors considered included compatibility with site conditions (e.g. site subsurface conditions, site physical features and chemical characteristics) and whether the technology had been proven to control the contaminants of concern. The screening criteria were applied based on site characteristics, published information, experience, and engineering judgment.

A technology or process option was rejected from further consideration if it:

- Would not be a practical method for the volume or area of contaminated soil to be remediated;
- Would not be an effective method for cleanup of all contaminants, either alone or in combination with another method, because of characteristics or concentrations of the contaminants present;
- Would not be feasible or effective because of site conditions, such as location, size, surrounding land use, geology and soils, and characteristics of the contaminated soil;
- Could not be effectively administered;
- Has not been successfully demonstrated for the site contaminants or media; or
- Has extremely high costs relative to other equally effective technologies or process options.

Tables 2 and 3 present the GRA, Remedial Technologies and Process Options for the CVOC and lead soil contamination, respectively. A description of the process options is provided to assist in evaluating the option's technical implementability. The Screening Comments indicate if a process option has been rejected or is potentially applicable. Where appropriate, information on the technical feasibility of an option and its ability to serve its intended purpose is provided. The retained technologies and process options are further evaluated in Section 5.4.

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TABLE 2

Preliminary Screening of Technologies and Process Options for TCE and PCE Remediation

General Response Action	Remedial Technology	Process Options	Description	Screening Comment
No Action	None	Not Applicable	No actions are taken.	Required for consideration by NCP.
Institutional Controls	Access and Use Restrictions	Deed Restrictions	Deed notice identifies; presence of soil contamination, restrictions concerning contaminated area, notice requirements and maintenance requirements.	Potentially applicable.
Institutional Controls	Monitored Attenuation	Contaminant Monitoring	Attenuation of contaminant is monitored.	Rejected as the contaminants of concern will still be a threat to human health and the environment. Particularly, TCE and PCE soil contamination will continue to act as a potential source of ground water contamination.
Containment	Cap	Clay and Soil	Placement of clay overlain with soil over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable
Containment	Cap	Asphalt	Placement of asphalt over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Cap	Concrete	Placement of concrete over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Cap	Multi Media	Placement of multi-media cap over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Subsurface Barriers	All Processes	Includes use of grouts or low permeability slurries to form impermeable subsurface barriers.	Rejected as horizontal migration of contamination is not a primary concern, the facility is an active industrial property creating difficulty for installation and there are more effective and practical methods.
Removal	Excavation	Excavation	Contaminated soil is excavated for transport.	Potentially applicable. Facility is active and excavation of soil beneath the building would be disruptive to operations and difficult to conduct.
Treatment	On-Site Incineration	Fluidized Bed or Rotary Kiln	Contaminated soil is heated to high temperatures to volatilize and combust organic contaminants.	Rejected as the associated capital costs are significantly higher than other process options such as excavation with off-site disposal based on the quantity of soil to be remediated at the site. The facility is active and excavation of soil

General Response Action	Remedial Technology	Process Options	Description	Screening Comment
				(an integral process operation to incineration) inside the building would be disruptive, there is not sufficient area on site for treatment and method would require significant quantities of soil to be cost effective.
Treatment	On-Site Thermal Desorption	Heating Units	Contaminated soil is heated to low to medium temperatures to volatilize water and organic contaminants. Volatiles are collected in a gas treatment system.	Rejected as facility is active and excavation of soil (an integral process operation to on-site thermal desorption) inside building would be disruptive, and there is not sufficient area on site for treatment.
Treatment	Aeration	Vapor Extraction	Air is drawn through contaminated soil creating a gradient for the transport of volatiles from the soil to gas phase. Volatiles are collected in a gas treatment system.	Rejected as facility is active, excavation of soil (an integral process operation to ex-situ vapor extraction) inside building would be disruptive, and there is not sufficient area on site for treatment.
Treatment	Physical/Chemical	Soil Washing	Contaminated soil is treated in an aqueous based system that separates contaminants from the soil particles. The wash water may contain various agents to help remove organics and heavy metals.	Rejected as facility is active, excavation of soil (an integral process operation to soil washing) inside building would be disruptive, and there is not sufficient area on site for treatment. Also method is geared towards heavy metals and non volatile organics.
Treatment	Physical/Chemical	Solidification/ Stabilization/Fixation	Contaminated soil is treated with materials that cause the contaminants to be bound or enclosed within the treated matrix so that it can not leach out.	Rejected as facility is active, excavation of soil (an integral process operation to solidification/stabilization) inside building would be disruptive, and there is not sufficient area on site for treatment. Also method is geared towards heavy metals and non volatile organics.
Treatment	Physical/Chemical	Solvent Extraction	Contaminated soil is mixed with solvent which extracts the contaminant from the soil. The solvent/extract mixture is then treated further.	Rejected as facility is active, excavation of soil (an integral process operation to solvent extracttion) inside building would be disruptive, and there is not sufficient area on site for treatment. Also method is geared towards soils contaminated with higher concentrations of CVOCs than are present at the Klockner Property.

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General Response Action	Remedial Technology	Process Options	Description	Screening Comment
Treatment	Biological	Aerobic or Anaerobic	Excavated soil is mixed with soil amendments and placed in an aboveground enclosure for treatment. The treatment can be done as a solid phase or as a slurry.	Rejected as facility is active, excavation of soil (an integral process operation to ex-situ biological treatment) inside building would be disruptive, and there is not sufficient area on site for treatment. Also method is geared towards soils contaminated with higher concentrations of CVOCs than are present at the Klockner Property.
Treatment	In-situ Treatment	Soil Vapor Extraction	A vacuum is placed on extraction wells creating a gradient for the transport of volatiles from the soil to the gas phase to the extraction wells for recovery.	Potentially applicable.
Treatment	In-situ Treatment	Bioventing	Air is drawn through the contaminated soil to enhance the biodegradation of contaminants.	Rejected as the CVOCs present in the soil are not readily biodegraded under aerobic conditions.
Treatment	In-situ Treatment	Steam Injection Combined with Vapor Extraction	Steam is injected into the contaminated soil to increase the mobility of volatiles for extraction.	Potentially applicable.
Treatment	In-situ Treatment	Hot Air Injection Combined with Vapor Extraction	Hot air is injected into the contaminated soil to increase the mobility of volatiles for extraction.	Potentially applicable.
Treatment	In-situ Treatment	Electrical Resistance Heating with Vapor Extraction	Electrodes placed in the ground create a current which causes the contaminated soil to heat up to increase the mobility of volatiles for extraction.	Potentially applicable.
Treatment	In-situ Treatment	Radio-frequency Heating with Vapor Extraction	Radio frequency is used to heat up the contaminated soil to increase the mobility of volatiles for extraction.	Potentially applicable.
Treatment	In-situ Treatment	Bioremediation	Bioremediation is a process that uses bacteria to degrade contaminants. Nutrients and other amendments may be introduced into the contaminated soil to enhance the biodegradation.	Potentially applicable. The CVOCs present in the soil are not readily biodegraded under aerobic conditions.
Treatment	In-situ Treatment	Phytoremediation	Phytoremediation is a process that uses plants to remove, transfer, stabilize and/or destroy contaminants in soil.	Rejected as a majority of the contaminated area is located beneath pavement and building coverage at this active industrial facility.
Treatment	In-situ Treatment	Chemical Reduction/Oxidation	Reduction/oxidation is a process that chemically converts contaminants to nonhazardous or less toxic compounds that are stable, less mobile and/or inert. Ozone, Fenton's Reagent and permanganate are commonly used oxidants.	Potentially applicable. 307405

General Response Action	Remedial Technology	Process Options	Description	Screening Comment
Treatment	In-situ Treatment	Soil Flushing	Water or water containing additives to enhance contaminant solubility is applied to the contaminated soil. The water leaches contaminants from the soil to the ground water which itself is treated.	Rejected due to difficulty of injecting flushing material beneath building structures, uncertainty of flushing liquid contacting less permeable soils and controlling flow and recovery of flushing liquid.
Treatment	In-situ Treatment	Vitrification	Electrodes placed in the ground creating a current which causes the contaminated soil to melt, producing a glass and crystalline structure with very low leaching characteristics.	Rejected due to hazards associated with this process (high heat, high electric current) and site conditions such as shallow depth of contaminants beneath an active building structure. This method is geared towards inorganic contamination.
Disposal	On-site	On-site Landfill	Excavated soil is permanently disposed in an on-site RCRA landfill.	Rejected as the Klockner Property is a developed and active industrial property with limited room for an on-site landfill.
Disposal	Off-site	Off-site RCRA Landfill	Excavated soil is transported to a RCRA landfill (Subtitle C or D) depending on classification. Waste may require treatment at disposal facility before be placed in landfill.	Potentially applicable.

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TABLE 3
Preliminary Screening of Technologies and Process Options for Lead Remediation

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General Response Action	Remedial Technology	Process Options	Description	Screening Comment
No Action	None	Not Applicable	No actions are taken.	Required for consideration by NCP
Institutional Controls	Access and Use Restrictions	Deed Restrictions	Deed notice identifies presence of soil contamination, restrictions concerning contaminated area, notice requirements and maintenance requirements.	Potentially applicable.
Institutional Controls	Monitored Attenuation	Contaminant Monitoring	Attenuation of contaminant is monitored.	Rejected as this process is not applicable to the shallow lead soil contamination at the Klockner Property.
Containment	Cap	Clay and Soil	Placement of clay overlain with soil over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Cap	Asphalt	Placement of asphalt over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Cap	Concrete	Placement of concrete over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Cap	Multi Media	Placement of multi-media cap over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Subsurface Barriers	All Processes	Includes use of grouts or low permeability slurries to form impermeable subsurface barriers.	Rejected as the lead contamination is not readily mobile in the subsurface at the site and the size of the area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Removal	Excavation	Excavation	Contaminated soil is excavated for transport.	Potentially applicable.
Treatment	On-Site Incineration	Fluidized Bed or Rotary Kiln	Contaminated soil is heated to high temperatures to volatilize and combust organic contaminants.	Rejected as it is not applicable to the lead soil contamination found at the site.
Treatment	On-Site Thermal Desorption	Heating Units	Contaminated soil is heated to low to medium temperatures to volatilize water and organic contaminants. Volatiles are collected in a gas treatment system.	Rejected as it is not applicable to the lead soil contamination found at the site.
Treatment	Aeration	Vapor Extraction	Air is drawn through contaminated soil creating a gradient for the transport of volatiles from the soil to gas phase. Volatiles are collected in a gas treatment system.	Rejected as it is not applicable to the lead soil contamination found at the site.

General Response Action	Remedial Technology	Process Options	Description	Screening Comment
Treatment	Physical/Chemical	Soil Washing	Contaminated soil is treated in an aqueous based system that separates contaminants from the soil particles. The wash water may contain various agents to help remove organics and heavy metals.	Rejected as the size of the lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Treatment	Physical/Chemical	Solidification/Stabilization/Fixation	Contaminated soil is treated with materials that cause the contaminants to be bound or enclosed within the treated matrix so that it can not leach out.	Rejected as the size of the lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Treatment	Physical/Chemical	Solvent Extraction	Contaminated soil is mixed with solvent which extracts the contaminant from the soil. The solvent/extract mixture is then treated further.	Rejected as the size of the lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Treatment	Biological	Aerobic or Anaerobic	Excavated soil is mixed with soil amendments and placed in an aboveground enclosure for treatment. The treatment can be done as a solid phase or as a slurry.	Rejected as it is not applicable to the lead soil contamination found at the site.
Treatment	In-situ Treatment	Soil Vapor Extraction	A vacuum is placed on extraction wells creating a gradient for the transport of volatiles from the soil to the gas phase to the extraction wells for recovery.	Rejected as it is not applicable to the lead soil contamination found at the site.
Treatment	In-situ Treatment	Bioventing	Air is drawn through the contaminated soil to enhance the biodegradation of contaminants.	Rejected as it is not applicable to the lead soil contamination found at the site.
Treatment	In-situ Treatment	Steam Injection Combined with Vapor Extraction	Steam is injected into the contaminated soil to increase the mobility of volatiles for extraction	Rejected as it is not applicable to the lead soil contamination found at the site.
Treatment	In-situ Treatment	Hot Air Injection Combined with Vapor Extraction	Hot air is injected into the contaminated soil to increase the mobility of volatiles for extraction	Rejected as it is not applicable to the lead soil contamination found at the site.
Treatment	In-situ Treatment	Electrical Resistance Heating with Vapor Extraction	Electrodes placed in the ground creating a current which causes the contaminated soil to heat up to increase the mobility of volatiles for extraction.	Rejected as it is not applicable to the lead soil contamination found at the site.
Treatment	In-situ Treatment	Radio-frequency Heating with Vapor Extraction	Radio frequency is used to heat up the contaminated soil to increase the mobility of volatiles for extraction.	Rejected as it is not applicable to the lead soil contamination found at the site.

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General Response Action	Remedial Technology	Process Options	Description	Screening Comment
Treatment	In-situ Treatment	Bioremediation	Bioremediation is a process that uses bacteria to degrade contaminants. Nutrients and other amendments may be introduced into the contaminated soil to enhance the biodegradation.	Rejected as it is not applicable to the lead soil contamination found at the site.
Treatment	In-situ Treatment	Phytoremediation	Phytoremediation is a process that uses plants to remove, transfer, stabilize and/or destroy contaminants in soil.	Rejected as the size of the lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation. Also, the contaminated area is located beneath pavement in this active industrial facility.
Treatment	In-situ Treatment	Chemical Reduction/Oxidation	Reduction/oxidation is a process that chemically converts contaminants to nonhazardous or less toxic compounds that are stable, less mobile and/or inert. Ozone and Hydrogen peroxide are commonly used oxidizers.	Rejected as it is not applicable to the lead soil contamination found at the site.
Treatment	In-situ Treatment	Soil Flushing	Water or water containing additives to enhance contaminant solubility is applied to the contaminated soil. The water leaches contaminants from the soil to the ground water which itself is treated.	Rejected as the size of the lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Treatment	In-situ Treatment	Vitrification	Electrodes placed in the ground creating a current which causes the contaminated soil to melt, producing a glass and crystalline structure with very low leaching characteristics.	Rejected as the size of the lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Disposal	On-site	On-site Landfill	Excavated soil is permanently disposed in an on-site RCRA landfill.	Rejected as the Klockner Property is a developed and active industrial property with limited room for an on-site landfill.
Disposal	Off-site	Off-site RCRA Landfill	Excavated soil is transported to a RCRA landfill (Subtitle C or D) depending on classification. Waste may require treatment at disposal facility before be placed in landfill.	Potentially applicable.

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5.5 Evaluation of Retained Remedial Technologies and Process Options

The results of the initial screening process identified remedial technologies and process options potentially applicable for the remediation of the contaminated soil at the site. The remedial action applies to one inorganic contaminant (lead) and two volatile organic compounds (TCE and PCE). The lead contamination is confined to a limited area along the northeast border of the Building 12 Property. TCE and PCE are present beneath asphalt paved and building covered areas at the Building 12 Property and PCE is present in an unpaved area at the Building 13 Property.

The Remedial Technologies and Process Options that survived the initial screening process were reevaluated on the basis of short and long-term aspects of three broad categories: effectiveness, implementability and cost. The purpose of this reevaluation is to narrow the number of Remedial Technologies and Process Options that will be developed into Remedial Alternatives.

Effectiveness evaluation of the alternative is performed to determine its effectiveness in protecting human health and the environment and its effectiveness in reducing toxicity, mobility and volume of the contaminant.

Implementability evaluation is based on both technical and administrative feasibility of the specific technology. It is used to screen technologies and process options to eliminate those that are unworkable at the site.

The cost evaluation at this stage is intended to provide a relative comparison of process options within a technology type.

The reevaluation of the Remediation Technologies and Process Options is presented in Tables 4 and 5 for CVOCs and lead, respectively. The retained technologies based on the reevaluation are identified in Tables 6 and 7. Information concerning each of the potentially applicable remedial technologies reevaluated is presented in Section 5.6.

5.5.1 Remedial Technologies and Process Options for TCE and PCE

The following is a list of possible Remedial Technologies and Process Options for remediating the TCE and PCE soil contamination at the Klockner Property. The reevaluation of these process options with respect to effectiveness, implementability and cost is presented in Table 4. (Process Options are included as bullet items under their respective Remedial Technology.)

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1. No Action

2. Access and Use Restrictions
   - Deed Restrictions

3. Capping
   - Clay and Soil
   - Asphalt
   - Concrete
   - Multi Media

4. Excavation and Disposal Off Site
   - Excavation
   - Off-site RCRA Landfill

5. In-situ Treatment
   - Soil Vapor Extraction (SVE)
   - In situ Thermal Treatment/ with SVE
     - Steam Injection with SVE
     - Hot Air Injection with SVE
     - Electrical Resistance Heating with SVE
     - Radio Frequency Heating with SVE
   - Bioremediation
   - Chemical Oxidation/Reduction

5.5.2 Remedial Technologies and Process Options for Lead

The following is a list of possible Remedial Technologies and Process Options for remediating the lead soil contamination at the Klockner Property. The reevaluation of these process options with respect to effectiveness, implementability and cost is presented in Table 5. (Process Options are included as bullet items under their respective Remedial Technology.)

1. No Action

2. Access and Use Restrictions
   - Deed Restrictions

3. Capping
   - Clay and Soil
   - Asphalt
   - Concrete
   - Multi Media

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4. Excavation and Disposal Off Site
   - Excavation
   - Off-site RCRA Landfill

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TABLE 4
Evaluation of Remedial Technologies and Process Options for TCE and PCE Remediation

General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
No Action	None	Not Applicable	Does not achieve remedial action objective.	Easily implemented.	None
Institutional Controls	Access and Use Restrictions	Deed Restriction	Does not achieve remedial action objective. Effectiveness depends on enforcement of restrictions. Used in conjunction with other technologies.	Easily implemented. Restrictions on future land use.	Low capital cost, low maintenance cost
Containment	Cap	Clay and Soil	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Disruptive to facility operations given current development and use of the Klockner Property and therefore, not easily implemented. Restrictions on future land use.	Low capital cost, moderate maintenance cost.
Containment	Cap	Asphalt	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Easily implemented, (easiest of the types of caps evaluated given the site conditions and use). Restrictions on future land use.	Low capital cost, moderate maintenance cost.
Containment	Cap	Concrete	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Easily implemented. (easier than the multi media and clay and soil types of caps given the site conditions and use). Restrictions on future land use.	Moderate capital cost, moderate maintenance cost
Containment	Cap	Multi Media	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Disruptive to facility operations as the removal and restoration of existing cover on the property would be required and therefore, not easily implemented, (asphalt and concrete caps would be more easily implemented given the site conditions and use). Restrictions on future land use.	High capital cost, moderate maintenance cost
Removal	Excavation	Excavation	Effective proven reliable technology. Short term effects include noise and dust. Would be used in conjunction with off-site disposal.	Disruptive to facility operations as the removal and restoration of the existing cover on the property would be required, Difficult to implement where contamination is located beneath the concrete floor inside Building 12. Easily implemented at Building 13 PCE soil contamination.	High Cost for TCE and PCE soil contamination at Building 12; and Low cost for PCE soil contamination at Building13, No maintenance

307413

General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
Treatment	In-situ Treatment	Soil Vapor Extraction	Effective proven technology and a presumptive remedy for VOCs.	Easily implemented and least complex of the treatment technologies. There would be some disruption to facility operations during system installation.	Low to moderate capital cost, moderate maintenance cost which are only for a short period of time as Soil Vapor Extraction is typically operated over a short duration, e.g., 1 to 3 years
Treatment	In-situ Treatment	Steam Injection combined with Vapor Extraction	Effective in reducing VOCs in soil under appropriate site conditions.	Moderate implementability. Difficulty in controlling steam flow in shallow soils, concerns with safety (heat) in tenant occupied areas.	Moderate capital cost if boiler present on site. High capital cost if steam generation required., moderate maintenance cost which are only for a short period of time as Steam Injection with Vapor Extraction is typically operated over a short duration, e.g., 1 to 3 years
Treatment	In-situ Treatment	Hot Air Iinjection combined with Vapor Extraction	Not as effective as steam injection due to low heat capacity of air.	Moderate implementability. Difficulty in controlling air flow in shallow soils, concerns with safety (heat) in tenant occupied areas.	Moderate capital cost, moderate maintenance cost which are only for a short period of time as Hot Air Injection with Vapor Extraction is typically operated over a short duration, e.g., 1 to 3 years
Treatment	In-situ Treatment	Electrical Resistance Heating with Vapor Extraction	Moderately effective, based on case study it may not reduce contaminants to meet remedial action objectives. This is a relatively new technology.	Moderate implementability. Would be disruptive to tenant's operations.	High capital cost, moderate maintenance cost which are only for a short period of time as Electrical Resistance Heating with Vapor Extraction is typically operated over a short duration, e.g., 1 to 3 years
Treatment	In-situ Treatment	Radio-Frequency Heating with Vapor Extraction	Studies would be required to determine the effectiveness of this technology. This is a relatively new technology.	Moderate implementability. Would be disruptive to tenant's operations. This is a relatively new technology and equipment may not be readily available.	High capital cost, moderate maintenance cost which are only for a short period of time as Radio Frequency Heating with Vapor Extraction is typically operated over a short duration, e.g., 1 to 3 years.

307414

General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
Treatment	In-situ Treatment	Bioremediation	Low to moderate effectiveness, Chlorinated VOCs do not readily break down, this is a slow process.	Moderate to difficult implementability. Difficulty in controlling delivery of nutrients and amendments to contaminated soil given site conditions.	Moderate capital cost, moderate maintenance cost
Treatment	In-situ Treatment	Chemical Oxidation	Studies would be required to determine the effectiveness of this technology. There are several oxidants available for use with TCE and PCE.	Moderate to difficult implementability. Difficulty in controlling delivery of the oxidant and safety concerns in tenant's operations in building area above contaminated soil. The difficulty of oxidant delivery is based on the type of delivery with aqueous phase delivery being very difficult.	Moderate capital cost, moderate maintenance
Disposal	Off-site	Off-site RCRA Landfill	Effective in removing contaminants to remedial action objectives. Moves contaminants from Klockner Property to a controlled landfill facility where treatment prior to disposal may be required. Conducted in concert with Excavation.	Difficult to implement due to location of contamination beneath the concrete floor inside Building 12. Easily implemented at Building 13 PCE soil contamination.	Low cost for non-hazardous disposal, High cost for hazardous disposal

307415

TABLE 5

Evaluation of Remedial Technologies and Process Options for Lead Remediation

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General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
No Action	None	Not Applicable	Does not achieve remedial action objective.	Easily implemented. May not be acceptable to local/federal authorities.	None
Institutional Controls	None	Deed Restriction	Does not achieve remedial action objective.	Does not achieve remedial action objective. The contamination straddles the property boundary and may extend a short distance onto the neighbor's property, if so, consent from the off-site property owner is required to address the off-site contamination.	Low capital, low maintenance
Containment	Cap	Clay and Soil	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Easily implemented (asphalt or concrete would be easier). A good portion of the contaminated soil would be excavated to allow construction of the cap to existing grade. The contamination straddles the property boundary and may extend a short distance onto the neighbor's property, if so, consent from the off-site property owner is required to address the off-site contamination. Restrictions on future land use.	Low capital cost, moderate maintenance cost.
Containment	Cap	Asphalt	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Easily implemented (easiest of the types of caps evaluated given the site conditions and use). The contamination straddles the property boundary and may extend a short distance onto the neighbor's property, if so, consent from the off-site property owner is required to address the off-site contamination. Restrictions on future land use.	Low capital cost, low maintenance cost

General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
Containment	Cap	Concrete	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Easily implemented. The contamination straddles the property boundary and may extend a short distance onto the neighbor's property, if so, consent from the off-site property owner is required to address the off-site contamination. Restrictions on future land use.	Low capital cost, low maintenance cost
Containment	Cap	Multi Media	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Easily implemented (asphalt or concrete would be easier). Restrictions on future land use. A good portion of the contaminated soil would be excavated to allow construction of the cap to existing grade. The contamination straddles the property boundary and may extend a short distance onto the neighbor's property, if so, consent from the off-site property owner is required to address the off-site contamination. Restrictions on future land use.	Moderate capital cost, moderate maintenance cost
Removal	Excavation	Excavation	Very effective, conducted in concert with Disposal.	Easily Implemented. The lead contamination is confined to a relatively small area of the parking lot. Not much more excavation effort is required to excavate the lead contaminated soil than is required to expose and prepare the area for cap installation. The contamination straddles the property boundary and may extend a short distance onto the neighbor's property, if so, consent from the off-site property owner is required to address the off-site contamination.	Low cost 307417
Disposal	Off-site	Off-site RCRA Landfill	Very effective, conducted in concert with Excavation. Of the remedial options presented, this would be the most effective given the	Easily Implemented. The lead contamination is confined to a relatively small area of the parking lot. The contamination straddles the property boundary and may	Low cost for non-hazardous disposal, Higher cost for hazardous disposal but still relatively low cost

General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
			limited size of the impacted area.	extend a short distance onto the neighbor's property, if so, consent from the off-site property owner is required to address the off-site contamination.	

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5.6 Description of Potential Remedial Technologies

A description of potentially applicable remedial technologies from the initial screening process (see Tables 2 and 3) follows. Tables 4 and 5 present an evaluation of the remedial technologies with respect to effectiveness, implementability and cost. The technologies evaluated include presumptive remedies. Where available, initial cost information is provided. Only the seriously considered remedial technologies are discussed in detail.

Soil vapor extraction (SVE), thermal desorption, and incineration are the presumptive remedies at Superfund sites with soils contaminated with halogenated volatile organic compounds (VOCs). Because a presumptive remedy is a technology that EPA believes, based upon its past experience, generally will be the most appropriate remedy for a specified type of site, the presumptive remedy approach will accelerate site-specific analysis of remedies by focusing the feasibility study efforts.

SVE is the EPA preferred presumptive remedy for VOCs. SVE has been selected most frequently to address VOC contamination at Superfund sites, and performance data indicate that it effectively treats waste in place at a relatively low cost. In cases where SVE will not work or where uncertainty exists regarding the ability to obtain required cleanup levels, thermal desorption may be the most appropriate response technology. In a limited number of situations, incineration may be most appropriate. Thermal desorption and incineration have been removed from consideration during the initial screening based on site conditions and high cost.

5.6.1 No Action

5.6.1.1 Description

Under the no action alternative, the remediation of the contaminated soils at the Klockner & Klockner property portion of Operable Unit #3 would end. There would be no reduction in the toxicity, and volume of contamination. Evaluation of the no action alternative is required by EPA, as it provides a baseline against which impacts of other alternatives can be compared.

5.6.1.2 Applicability

No Action alternative is applicable for TCE, PCE and lead soil contamination.

5.6.1.3 Limitations

The no action alternative will allow potential exposures to persist. The VOCs present in the soil would remain as a potentially continuing source of ground water contamination. Under this

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alternative, there would be no remediation, monitoring, or controls over the contaminated site. Exposure could occur in the following ways:

- Migration of the contamination to ground water
- Migration of contaminant to off-site location
- Vapor intrusion from contaminated soil and ground water

5.6.1.4 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, depth to water table, and soil type and properties (e.g., structure, texture, permeability, and moisture content). This data identifies the site conditions and location of contaminants which enable the evaluation of this alternative. This information has already been obtained and is presented in the Final Remedial Investigation Report.

5.6.1.5 Performance Data

No action alternative is implemented in situations where the concentration of the contaminant is very low and the potential for exposure is low.

5.6.1.6 Cost

This is the lowest cost alternative as no action is required for remediation.

5.6.1.7 Results of Evaluation

The No Action alternative will be carried through the evaluation process as required under NCP.

5.6.2 Access and Use Restrictions

5.6.2.1 Description

Access and Use Restrictions are designed to reduce exposure to toxic chemicals and protect human health by restricting land use. The most common Access and Use Restriction is a restrictive covenant in the form of deed notice.

5.6.2.2 Applicability

Access and Use Restrictions are applicable for TCE, PCE and lead soil contamination.

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5.6.2.3 Limitations

Access and Use Restrictions do not reduce the toxicity, mobility or the volume of the contaminant. A deed notice would specify any requirements for monitoring, maintenance of potential engineering controls and restrictions on property use to prevent the dispersion of or exposure to any contaminated soil. Restrictive covenants would also require notification of the presence of soil contamination and can be long term.

5.6.2.4 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, depth to water table, and soil type and properties (e.g., structure, texture, permeability, and moisture content). This information is used to identify the site conditions in the institutional controls (e.g. Deed Notice).

5.6.2.5 Performance Data

Access and Use Restrictions are readily available and have been successfully used.

5.6.2.6 Cost

The cost of imposing Access and Use Restrictions is low as they involve long term monitoring and legal and administrative costs.

5.6.2.7 Results of Evaluation

Access and Use Restrictions is being retained for further evaluation as it is an important component for conducting other remedial technologies, (i.e. capping).

5.6.3 Capping

5.6.3.1 Description

Capping is a common form of remediation because it is generally less expensive than other technologies and effectively manages the human and ecological risks associated with a remediation site. The most common caps are Clay and Soil, Asphalt, Concrete and Multi Media.

The most effective single-layer caps are composed of concrete or bituminous asphalt. It is used to form a surface barrier between contaminated soil and the environment. An asphalt or concrete cap would reduce leaching through the soil into an adjacent aquifer.

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Multi-layer caps can be composed of clay and soil or multi-media (i.e geotextiles combined with other materials). These caps form a surface or subsurface barrier between contaminated soil and the environment. A clay and soil or multi-media cap would reduce leaching through the soil into an adjacent aquifer.

5.6.3.2 Applicability

Caps prevent direct contact with contaminated soil and prevent vapor intrusion. They also minimize surface water infiltration through the contaminated soil and the migration of contaminants into the ground water. In conjunction with water diversion and detention structures, caps may be designed to route surface water away from the contaminated soil. Capping is applicable for TCE, PCE and lead soil contamination. As a majority of the contaminants are already under the foot print of the building, it is already capped. The remaining area outside the building can be easily capped to prevent migration of the contaminants. The use of Clay and Soil, and Multi Media caps would be disruptive to the site and would alter

5.6.3.3 Limitations

Capping does not lessen toxicity or volume of the contaminant, but does mitigate migration and exposure, including direct contact with contaminated soil. Caps are most effective where most of the underlying contaminant is above the water table. A cap, by itself, cannot prevent the horizontal flow of ground water through the waste, only the vertical entry of water into the waste. Caps are susceptible to weathering and cracking. Therefore, the effective life of a cap can be extended by long-term inspection and maintenance. Precautions must be taken to assume that the integrity of the cap is not compromised by land use activities. A restriction on future land use would be required.

Clay and Soil, and Multi-Media caps would require excavation activities for installation. Significant soil removal and/or concrete and asphalt removal would be required to install the cap to the current property grade. The installation will significantly disrupt tenants operations. Existing paving and concrete floors would have to be removed to allow cap installation and then restored to allow continued use of the site by the current tenants.

5.6.3.4 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, condition and type of existing cover (e.g. asphalt, concrete soil), depth to water table, and soil type and properties (e.g., structure, texture, permeability, and moisture content).

5.6.3.5 Performance Data

Previously installed caps are hard to monitor for performance. Monitoring well systems or infiltration monitoring systems can provide some information, but it is often not possible to determine the source of the contaminant. Caps are often installed to prevent, or significantly reduce, the migration of contaminants in soils or ground water. Containment is necessary whenever contaminated materials are to be buried or left in place at a site. In general, containment is performed when extensive subsurface contamination at a site precludes excavation and removal of wastes because of potential hazards or lack of adequate treatment technologies.

5.6.3.6 Cost

Containment treatment such as caps offer quick installation times and are typically a low to moderate cost treatment group. Unlike ex situ treatment groups, containment does not require significant excavation of soils that lead to increased costs from engineering design of equipment, possible permitting, and material handling. Some of these additional costs could possibly be incurred for the installation of a clay and soil or a multi media cap if a site is already developed and existing cover (i.e. asphalt paving, concrete paving) must be removed and replaced to meet existing property use and grade. Capping requires periodic inspections. Additionally, ground water monitoring wells, associated with the treatments, may need to be periodically sampled and maintained. Even with these long-term requirements, containment treatments usually are considerably more economical than excavation and removal of the wastes.

5.6.3.7 Results of Evaluation

Capping with asphalt and concrete are being retained for further evaluation based on the above information. Capping with clay and soil, and multi-media are not being retained for further evaluation based on the reasons presented in 5.6.3.3 Limitations above (i.e. excavation of existing asphalt paving, concrete floors and underlying soil to attain appropriate finished grade, significant disruption of site and tenants operations).

5.6.4 Excavation, and Off-Site Disposal

5.6.4.1 Description

Contaminated material is removed and transported to permitted off-site treatment and/or disposal facilities. Some pretreatment of the contaminated media usually is required in order to meet land disposal restrictions.

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5.6.4.2 Applicability

Excavation and off-site disposal is applicable to the complete range of contaminant groups with no particular target group. Therefore, it is applicable for TCE, PCE and lead soil contamination.

5.6.4.3 Limitations

Factors that may limit the applicability and effectiveness of the process include:

- Generation of fugitive emissions may be a problem during operations.
- The distance from the contaminated site to the nearest disposal facility with the required permit(s) will affect cost.
- Depth and composition of the media requiring excavation must be considered.
- Transportation of the soil through populated areas may affect community acceptability.
- Limited accessibility of the contaminated area to excavation in areas beneath the active building structure.

5.6.4.4 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, depth to water table, and soil type.

5.6.4.5 Performance Data

Excavation and off-site disposal is a well proven and readily implementable technology. Excavation is the initial component in all ex situ treatments.

CERCLA includes a statutory preference for treatment of contaminants, and excavation and off-site disposal is now less acceptable than in the past. The disposal of hazardous wastes is governed by RCRA (40 CFR Parts 261-265), and the U.S. Department of Transportation (DOT) regulates the transport of hazardous materials (49 CFR Parts 172-179, 49 CFR Part 1387, and DOT-E 8876). Wastes can be disposed at a solid waste landfill if categorized as nonhazardous.

5.6.4.6 Cost

Cost estimates for excavation and disposal as a hazardous waste range from $300 to $510 per metric ton ($270 to $460 per ton). These estimates include excavation/removal, transportation, and disposal at a RCRA permitted facility. The estimated cost for excavation and disposal as a non-hazardous waste range from $165 to $220 per metric ton ($150 to $200 per ton). Additional cost of treatment at disposal facility may also be required. Excavation and off-site disposal is a relatively simple process, with proven procedures. It is a labor-intensive practice with little potential for further automation. Additional costs may include soil characterization and treatment to meet land ban requirements.

5.6.4.7 Results of Evaluation

Excavation with off-site disposal is being retained for further evaluation based on the above information.

5.6.5 In-situ Treatment - Soil Vapor Extraction

A vacuum is applied through extraction wells to create a pressure/concentration gradient that induces gas-phase volatiles to be removed from soil through extraction wells. This technology also is known as in situ soil venting, in situ volatilization, enhanced volatilization, or soil vacuum extraction.

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Typical In Situ Soil Vapor Extraction System

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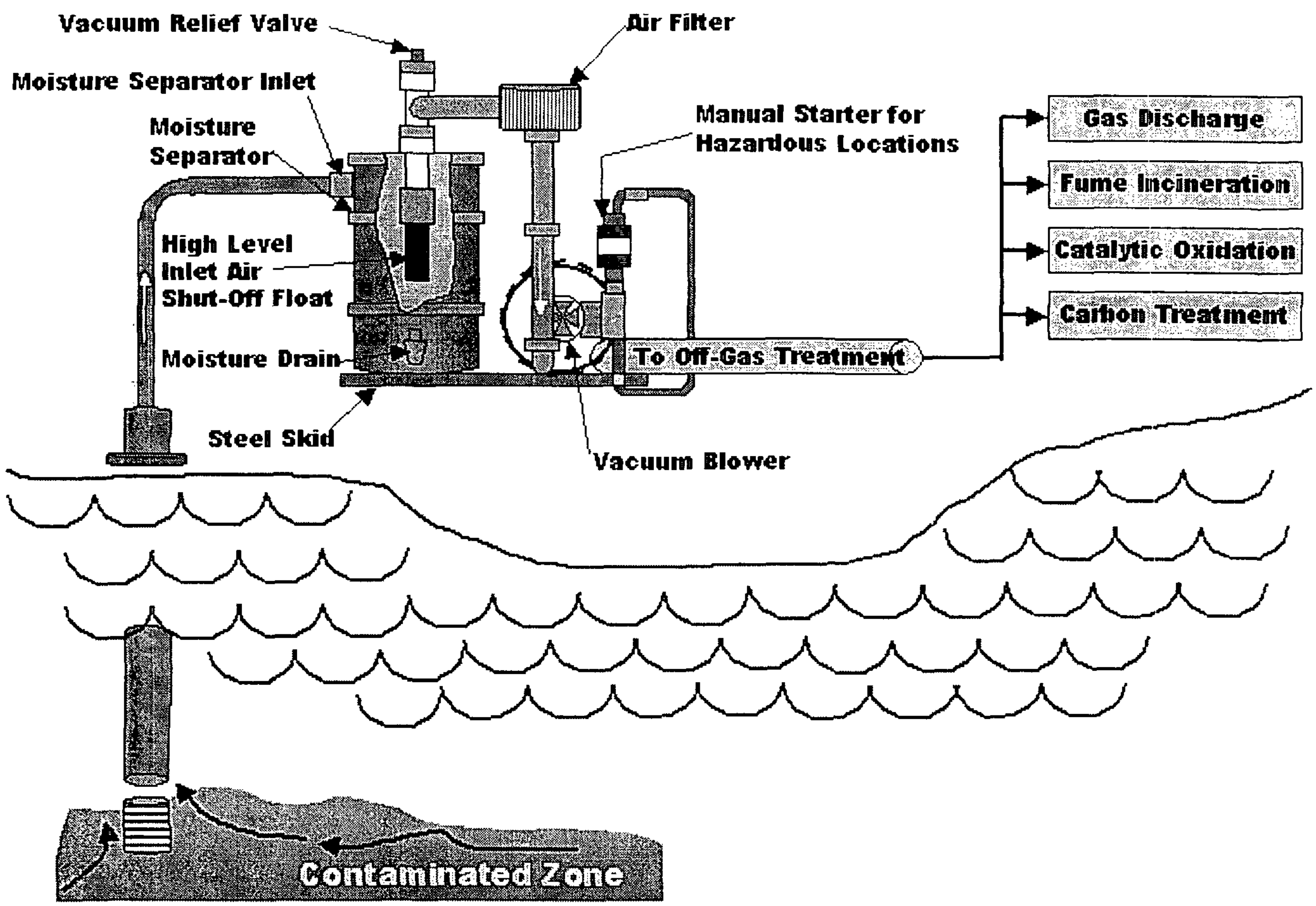

SVE is an in situ unsaturated (vadose) zone soil remediation technology in which a vacuum is applied to the soil to induce the controlled flow of air and remove volatile and some semivolatile contaminants from the soil. The gas leaving the soil may be treated to recover or destroy the contaminants, depending on local and state air discharge regulations. Potential options for off-gas treatment include incineration, catalytic oxidation and carbon adsorption. The type of off-gas treatment used will be dependent on the concentration of contaminants in the off-gas, the flow rate of the off-gas and type of contaminants present. Vertical extraction vents are typically used at depths of 1.5 meters (5 feet) or greater. Horizontal extraction vents (installed in trenches or horizontal borings) can be used as warranted by contaminant zone geometry, drill rig access, or other site-specific factors.

Ground water depression pumps may be used to reduce ground water upwelling induced by the vacuum or to increase the depth of the vadose zone. Air injection is effective for facilitating extraction of deep contamination and contamination in low permeability soils. The duration of operation and maintenance for in situ SVE is typically 1 to 3 years.

5.6.5.1 Applicability

The target contaminant groups for in situ SVE are VOCs and some fuels. The technology is typically applicable only to volatile compounds with a Henry's law constant greater than 0.01 or a vapor pressure greater than 0.5 mm Hg (0.02 inches Hg). Vapor Pressure for TCE is 58 mm of Hg, and for PCE it is 18.47 mm of Hg, making them good candidates for the process. Other factors, such as the moisture content, organic content, and air permeability of the soil, also will impact the effectiveness of in situ SVE. Because the process involves the continuous flow of air through the soil, however, it often promotes the in situ biodegradation of low-volatility organic compounds that may be present. SVE is not applicable to lead.

5.6.5.2 Limitations

Factors that may limit the applicability and effectiveness of the process include:

- Soil that has a high percentage of fines and a high degree of saturation will require higher vacuums (increasing costs) and/or will hinder the operation of the in situ SVE system.
- Large screened intervals are required in extraction wells for soil with highly variable permeabilities or stratification, which otherwise may result in uneven delivery of gas flow from the contaminated regions.
- Soil that has high organic content or is extremely dry has a high sorption capacity of VOCs, which results in reduced removal rates.
- Exhaust air from in situ SVE system may require treatment to eliminate possible harm to the public and the environment.
- As a result of off-gas treatment, residual liquids may require treatment/disposal. Spent activated carbon definitely will require regeneration or disposal.
- SVE is not effective in the saturated zone.

5.6.5.3 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, depth to water table, and soil type and properties (e.g., structure, texture, permeability, and moisture content).

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Pilot studies should be performed to provide design information, including extraction well, radius of influence, gas flow rates, optimal applied vacuum, and contaminant mass removal rates.

5.6.5.4 Performance Data

A field pilot study is necessary to establish the feasibility of the method as well as to obtain information necessary to design and configure the system. During full-scale operation, in situ SVE can be operated intermittently (pulsed operation) once the extracted mass removal rate has reached an asymptotic level. This pulsed operation can increase the cost-effectiveness of the system by facilitating extraction of higher concentrations of contaminants. After the contaminants are removed by in situ SVE, other remedial measures, such as biodegradation or engineering controls, can be investigated if remedial action objectives have not been met. In situ SVE projects are typically completed in 1 to 3 years.

5.6.5.5 Cost

The cost of in situ SVE is site-specific, depending on the size of the site, the nature and amount of contamination, and the hydrogeological setting (EPA, July 1989). These factors affect the number of wells, the blower capacity and vacuum level required, and the length of time required to remediate the site. A requirement for off-gas treatment adds significantly to the cost. Water is also frequently extracted during the process and usually requires treatment prior to disposal, further adding to the cost. Cost estimates for in situ SVE range between \$10 and \$50 per cubic meter (\$10 and \$40 per cubic yard) of soil. Pilot testing typically costs \$10,000 to \$40,000.

5.6.5.6 Results of Evaluation

In-situ SVE is being retained for further evaluation as it is a presumptive remedy for VOCs soil contamination and is relatively cost effective.

5.6.6 In Situ Thermal Treatment

In situ thermal treatment is a full-scale technology that uses electrical resistance/electromagnetic/fiber optic/radio frequency heating or hot-air/steam injection to increase the volatilization rate of semi-volatiles and volatiles and facilitate extraction. The volatilized contaminants are collected by SVE. These technologies are discussed below.

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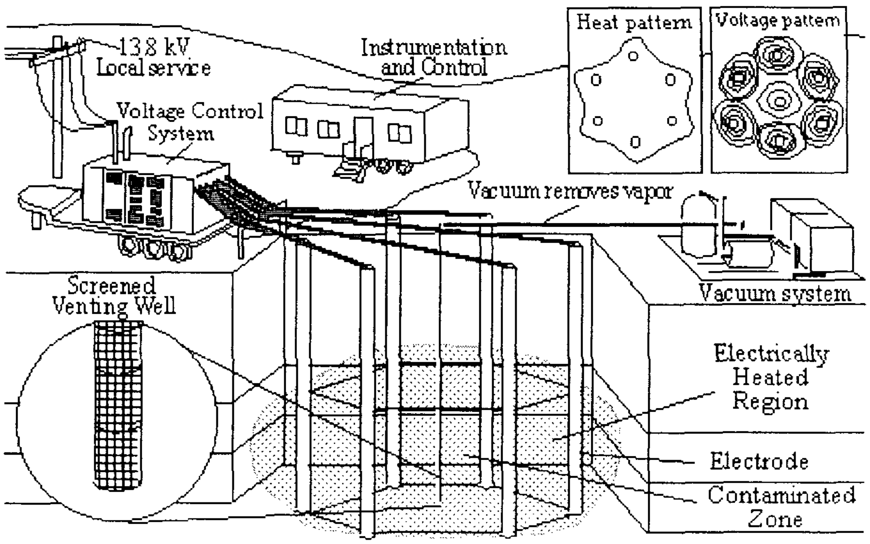
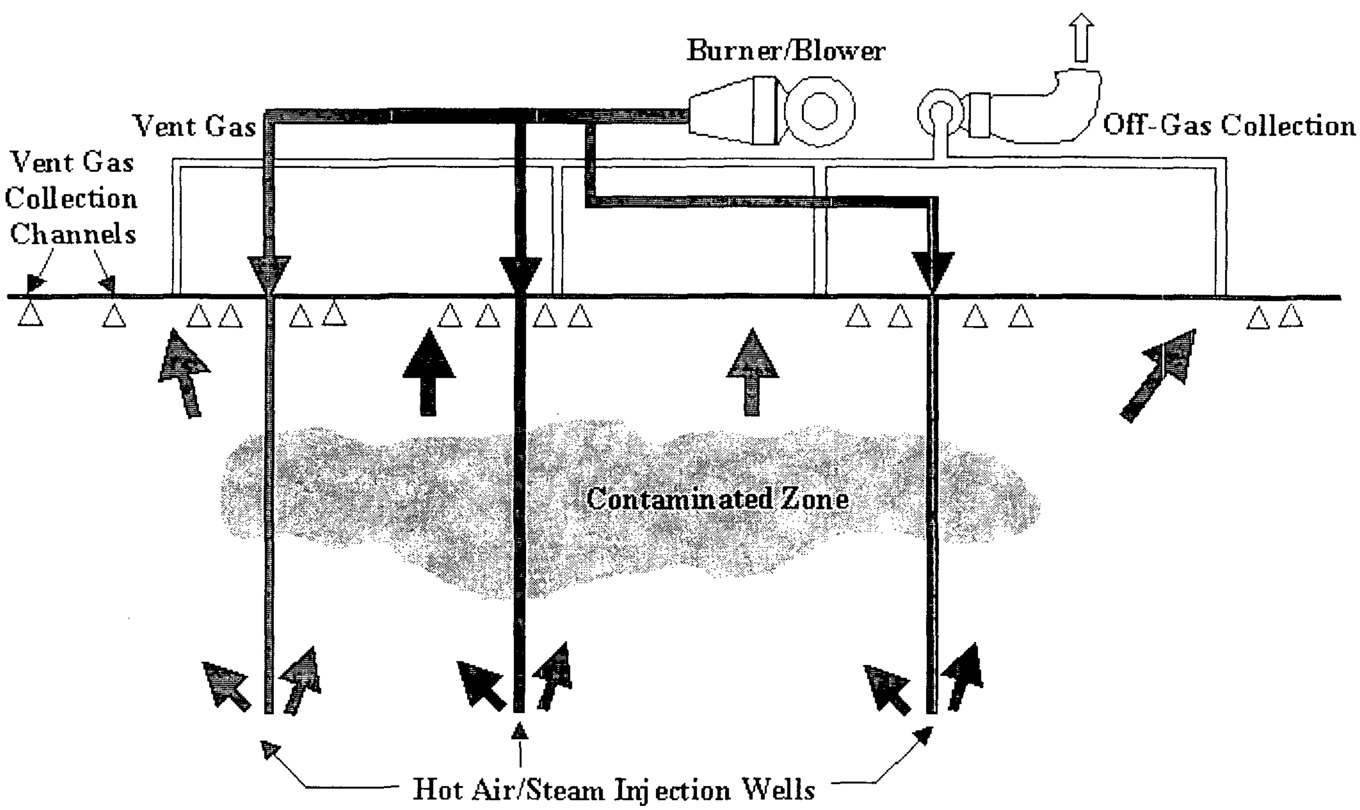
Typical Six-Phase Soil Heating System



Typical Hot Air System



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The process is otherwise similar to standard SVE, but requires heat resistant extraction wells. In situ thermal treatment with SVE is normally a short-term technology.

5.6.6.1 Electrical Resistance Heating

Electrical resistance heating uses an electrical current to heat less permeable soils such as clays and fine-grained sediments so that water and contaminants trapped in these relatively conductive regions are vaporized and ready for vacuum extraction. Electrodes are placed directly into the less permeable soil matrix and activated so that electrical current passes through the soil, creating a resistance, which then heats the soil. The heat dries out the soil causing it to fracture. These fractures make the soil more permeable allowing the use of SVE to remove the contaminants. The heat created by electrical resistance heating also forces trapped liquids to vaporize and move to the steam zone for removal by SVE. Six-phase soil heating (SPSH) is a typical electrical resistance heating which uses low-frequency electricity delivered to six electrodes in a circular array to heat soils. With SPSH, the temperature of the soil and contaminant is increased, thereby increasing the contaminant's vapor pressure and its removal rate. SPSH also creates an in situ source of steam to strip contaminants from soil. At this time SPSH is in the demonstration phase, and all large scale in situ projects utilize three-phase soil heating.

5.6.6.2 Radio Frequency/Electromagnetic Heating

Radio frequency heating (RFH) is an in situ process that uses electromagnetic energy to heat soil and enhance SVE. The RFH technique heats a discrete volume of soil using rows of vertical electrodes embedded in soil (or other media). Heated soil volumes are bounded by two rows of ground electrodes with energy applied to a third row midway between the ground rows. The three rows act as a buried triplate capacitor. When energy is applied to the electrode array, heating begins at the top center and proceeds vertically downward and laterally outward through the soil volume. The technique can heat soils to over 300 °C.

RFH enhances SVE in four ways: (1) contaminant vapor pressure and diffusivity are increased by heating, (2) the soil permeability is increased by drying, (3) an increase in the volatility of the contaminant from in situ steam stripping by the water vapor, and (4) a decrease in the viscosity which improves mobility. The technology is self limiting; as the soil heats and dries, current will stop flowing. Extracted vapor can then be treated by a variety of existing technologies, such as granular activated carbon or incineration.

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5.6.6.3 Hot Air/Steam Injection

Hot air or steam is injected below the contaminated zone to heat up contaminated soil. The heating enhances the release of contaminants from the soil matrix. Some VOCs and SVOCs are stripped from the contaminated zone and brought to the surface through SVE.

5.6.6.4 Applicability

High moisture content is a limitation of standard SVE that thermal enhancement may help overcome. Heating, especially radio frequency heating and electrical resistance heating can improve air flow in high moisture soils by evaporating water. The system is designed to treat semivolatiles but will consequently treat volatiles. In situ thermal treatment is not applicable to lead. After application of this process, subsurface conditions are excellent for biodegradation of residual contaminants.

5.6.6.5 Limitations

The following factors may limit the applicability and effectiveness of the process:

- Debris or other large objects buried in the media can cause operating difficulties.
- Performance in extracting certain contaminants varies depending upon the maximum temperature achieved in the process selected.
- Soil that is tight or has high moisture content has a reduced permeability to air, hindering the operation of thermally enhanced SVE and requiring more energy input to increase vacuum and temperature.
- Soil with highly variable permeabilities may result in uneven delivery of gas flow to the contaminated regions.
- Soil that has a high organic content has a high sorption capacity of VOCs, which results in reduced removal rates.
- Air emissions may need to be regulated to eliminate possible harm to the public and the environment. Air treatment and permitting will increase project costs.
- Residual liquids and spent activated carbon may require further treatment.
- Thermally enhanced SVE is not effective in the saturated zone; however, lowering the aquifer can expose more media to SVE.
- Hot air injection has limitations due to low heat capacity of air.
- Difficulty in controlling the direction of the steam/hot air migration through the shallow silty clay.

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5.6.6.6 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, depth to water table, and soil type and properties (e.g., structure, texture, permeability, and moisture content).

Pilot studies should be performed to provide design information, including extraction well, radius of influence, gas flow rates, optimal applied vacuum, optimal heat injection and contaminant mass removal rates.

5.6.6.7 Performance Data

Thermal Treatment has been used for the remediation of solvent contaminated soils. Its success will depend on the soil and site conditions. A field pilot study is necessary to establish the feasibility of the method as well as to obtain information necessary to design and configure the system. After the contaminants are removed by in situ thermal treatment, other remedial measures, such as biodegradation or engineering controls, can be investigated if remedial action objectives have not been met.

5.6.6.8 Cost

Available data indicate the overall cost for thermally enhanced SVE systems is approximately \$30 to \$130 per cubic meter (\$25 to \$100 per cubic yard) for some methods. High capital and energy costs are anticipated for the Electrical Resistance Heating and Radio Frequency Heating options.

5.6.6.9 Results of Evaluation

In-situ thermal treatment is not being retained for further evaluation based on the reasons presented in 5.6.6.5 Limitations above.

5.6.7 In-Situ Bioremediation

5.6.7.1 Description

During in-situ bioremediation, the activity of naturally occurring microbes is stimulated by circulating water-based solutions through contaminated soils to enhance in-situ biological remediation of organic contaminants. Nutrients, oxygen (or other electron acceptors), or other amendments may be used to enhance bioremediation and contaminant desorption from subsurface materials. Generally, the process includes above-ground treatment and conditioning

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of the infiltration water with nutrients and an oxygen (or other electron acceptor) source. In-situ bioremediation is a full-scale technology.

5.6.7.2 Applicability

Target contaminants for in-situ aerobic bioremediation are non-halogenated VOCs and SVOCs, and fuel hydrocarbons. Halogenated VOCs and SVOCs also can be treated, but the process may be less effective and may only be applicable to some compounds within these contaminant groups. Aerobic in-situ bioremediation is not applicable to TCE and PCE. In-situ bioremediation is not applicable to lead.

5.6.7.3 Limitations

The following factors may limit the applicability and effectiveness of this process:

- Extensive treatability studies and site characterization may be necessary.
- The circulation of water-based solutions through the soil may increase contaminant mobility.
- The injection of microorganisms into the subsurface is not recommended. Naturally occurring organisms are generally adapted to the contaminants present.
- Preferential flow paths may severely decrease contact between injected fluids and contaminants throughout the contaminated zones.
- The system should be used only where ground water is near the surface and where the ground water underlying the contaminated soils is contaminated.
- The system should not be used for clay, highly layered, or heterogeneous subsurface environments due to oxygen (or other electron acceptor) transfer limitations.
- Bioremediation may not be applicable at sites with high concentrations of heavy metals, highly chlorinated organics, inorganic salts, or other materials that are toxic to on site bacteria.
- Anaerobic conditions would have to be created for certain compounds such as the TCE and PCE present at the site.

5.6.7.4 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, type of microorganisms present and soil type and properties (e.g., nutrients, structure, texture, permeability, and moisture content).

Bench scale and/or pilot studies should be performed to provide design information, including nutrient requirements and contaminant mass removal rates.

5.6.7.5 Performance Data

Bioremediation has been successfully used for the treatment of chlorinated solvent contaminated soil. The success of the process may be limited by the clay content of the soil, ability to create anaerobic conditions and ability to deliver nutrients to the contaminated areas.

5.6.7.6 Cost

In-situ Bioremediation is a moderate cost alternative.

5.6.7.7 Results of Evaluation

In-situ Bioremediation is not being retained for further evaluation based on the reasons presented in 5.6.7.3 Limitations above.

5.6.8 In-situ Treatment – Chemical Oxidation

5.6.8.1 Description

In-situ chemical oxidation involves the injection of an oxidizing compound into the subsurface. Fenton's Reagent (modified hydrogen peroxide), potassium and sodium permanganate, sodium persulfate and ozone have been shown to be effective in treating PCE and TCE. The efficiency of performing chemical oxidation in the vadose zone (particularly using the liquid oxidants) is greatly reduced with respect to efficiencies in the saturated zone. However, ozone has been shown to be relatively effective in treating PCE and TCE in vadose zone soils. Ozone generating systems have been designed to destroy the contaminants PCE and TCE in situ. Several ozone injection projects have demonstrated the potential for ozone to remediate PCE and TCE contaminated sites.

5.6.8.2 Applicability

The target contaminant group for oxidation/reduction includes inorganics and organics. Oxidation/reduction is a well-established technology used for disinfecting drinking water and wastewater, and is a common treatment for cyanide wastes. Enhanced systems are now being used more frequently to treat hazardous wastes in soils. Chemical oxidation results in the complete mineralization of the target contaminant to carbon dioxide (CO_2), water and any associated salt (i.e., Cl^-).

In situ chemical oxidation using ozone generation system offers a number of significant advantages for on-site remediation, including:

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- Potential for complete destruction of PCE and TCE without the formation of harmful byproducts
- PCE, TCE and other amenable compounds are treated in one system

In situ oxidation is not applicable to elemental lead.

5.6.8.3 Limitations

The following factors may limit the applicability and effectiveness of this process:

- Potential for incomplete oxidation or formation of intermediate contaminants that are more toxic than the original contaminants may occur depending upon the contaminants and oxidizing agents used. (The CVOCs of concern are readily oxidized with any potential intermediates being short lived and readily oxidized themselves.)
- The process is not cost-effective for highly contaminated materials due to the large stoichiometric amounts of oxidant/reductant required.
- The chemicals used in oxidation/reduction pose a potential health and safety risk to site workers through skin contact and air emissions. Personal protective equipment, at a level commensurate with the contaminants involved, is normally required during treatment operations.
- Injection of ozone beneath a structure raises concerns for potential migration of the ozone into the building space where worker exposure could occur. Appropriate precautions (i.e. ambient monitoring and/or vapor collection) would be required to detect potential exposure.
- The natural oxidant demand of the soil in the area being treated will affect the mass of oxidant required to treat the target contaminants.
- The success of the delivery of the oxidizing agent to a source area will be dependent on the site conditions. With respect to soil, aqueous based oxidizing solutions will follow preferential pathways and may not even contact the contaminated soil. Ozone may have more success as it is a gas but it too may be limited in its delivery to different soil types, i.e clay difficult, sand easier.

5.6.8.4 Data Needs

Engineering of in situ chemical oxidation must be done with due attention paid to reaction chemistry and transport processes. It is also critical that close attention be paid to worker training and safe handling of process chemicals as well as proper management of remediation wastes. The design and implementation process should rely on an integrated effort involving screening

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level characterization tests and reaction transport modeling, combined with treatability studies at the lab and field scale.

5.6.8.5 Performance Data

In situ chemical oxidation is a viable remediation technology for mass reduction in source areas as well as for plume treatment. In situ chemical oxidation has been successfully used for the treatment of TCE and PCE. Stoichiometrically, approximately 7 pounds of ozone is required to completey mineralize 1 pound of TCE or PCE. The potential benefits of in situ oxidation include the rapid and extensive reactions with various COCs. Also, in situ chemical oxidation can be tailored to a site and implemented with relatively simple, readily available equipment.

Two major limitation associated with ozonation (and all other chemical oxidation) are the ability to deliver the oxidant effectively to the contaminant, and the natural oxidant demand (NOD) of the site soils. Components that contribute to the NOD include naturally occurring organic compounds (e.g., humates), reduced metals (e.g., ferrous iron) as well as carbonate formations in some instances. The other contaminants present at the site (e.g., lead) is not amenable to ozone oxidation, and will not contribute to the overall oxidant demand.

The success of the delivery of the oxidant to the contaminants will be dependent on soil and site conditions. The control of the flow of ozone through the contaminated soil zone and to preclude ozone from "escaping" the subsurface may require the use of soil vapor extraction. Further research and development is ongoing to advance the science and engineering of in situ chemical oxidation and to increase its overall cost effectiveness.

5.6.8.6 Cost

This is a moderate cost process option.

5.6.8.7 Result of Evaluation

Chemical Oxidation using aqueous based delivery methods is not being retained for further evaluation based on the reasons presented in Sections 5.6.8.1 Description and 5.6.8.3 Limitations above (i.e. improbability of injected liquid contacting contaminated soil). Chemical oxidation using ozone injection is being retained for further evaluation because it has been shown to be effective in treating the COCs, and can be effectively delivered to the subsurface.

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TABLE 6

Retained Technologies and Process Options for TCE and PCE Soil Remediation

General Response Action	Remedial Technology	Process Options
No Action	None	Not Applicable
Institutional Controls	Access and Use Restrictions	Deed Restrictions
Containment	Caps	Asphalt
		Concrete
Removal	Excavation	Excavation
Treatment	In-situ Treatment	Soil Vapor Extraction
		Chemical Oxidation
Disposal	Off-site	Off-site RCRA Landfill

TABLE 7

Retained Technologies and Process Options for Lead Soil Remediation

General Response Action	Remedial Technology	Process Options
No Action	None	Not Applicable
Institutional Controls	Access and Use Restrictions	Deed Restrictions
Containment	Caps	Asphalt
		Concrete
Removal	Excavation	Excavation
Disposal	Off-site	Off-site RCRA Landfill

6.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

6.1 Introduction

Using the retained remedial technologies and process options, Whitman has developed an array of remedial alternatives that can eliminate, reduce, or control the potential risks to human health and the environment present at the Klockner Property. The remedial alternatives are combinations of the retained remedial technologies and process options identified in Tables 6 and 7. A detailed analysis of the remedial alternatives will be conducted in the Feasibility Study.

The following key site-specific conditions also were considered during development of the Operable Unit #3 alternatives:

- The RAOs
- The distribution of TCE, PCE and lead
- Existing remedial actions
- Amajor transportation corridor
- The commercial and residential nature of the surface above the majority of the Klockner Property

The remedial alternatives differ primarily in the treatment location and the mode of treated waste disposal. The alternatives are described below.

6.1.1 Description of Remedial Alternatives for TCE and PCE

The retained remedial technologies and process options used to form the remedial alternatives described below include:

- No action
- Access and Use Restrictions – Deed Restrictions
- Capping – Asphalt and Concrete
- Excavation and Off-site Disposal
- In-situ Treatment - Soil Vapor Extraction (SVE)
- In-situ Treatment – Chemical Oxidation

The following remedial alternatives were formulated using the above listed remedial technologies and process options.

- Alternative V1: No Action
- Alternative V2: Access and Use Restrictions, and Capping
- Alternative V3: Excavation and Off-Site Disposal with Capping and Access and Use Restrictions
- Alternative V4: Soil Vapor Extraction with Excavation and Off-Site Disposal, and Capping and Access and Use Restrictions
- Alternative V5: Chemical Oxidation with Soil Vapor Extraction with Excavation and Off-Site Disposal, and Capping and Access and Use Restrictions

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6.1.1.1 Alternative V1: No Action

The No Action Alternative (Alternative V1) would not actively control, treat, or monitor the contamination in soil. The TCE and PCE would be allowed to migrate, dissipate, and decay naturally. The No Action Alternative is retained for consideration in accordance with the NCP.

Cost: There would be no capital or operating, maintenance, or monitoring cost for this alternative. It would be the least expensive alternative.

Time: Concentrations of TCE and PCE would remain above clean-up goals for an indeterminate time.

6.1.1.2 Alternative V2: Access and Use Restrictions, and Capping

Alternative V2 is a combination of Access and Use Restrictions, and Capping. Under this alternative, the contaminated soil areas would be capped with asphalt or concrete. A Deed Notice would be filed with the appropriate authorities and interested parties identifying the access and use restrictions.

A cap prevents migration of the contaminants and prevents it from acting as a source. The primary route of contaminant migration from the soil to the ground water is typically through the movement of water through the soil column. If water is prevented from percolating through the contaminated soil, further migration could be prevented or limited. The presence of asphalt paved surfaces and concrete floored building coverage at the Building 12 Property will prevent the infiltration of water through the contaminated soil although some infiltration may occur (i.e. through damaged pavement). The former tank excavation area in the Building 12 alleyway and the Building 13 PCE soil contamination area are currently unpaved and would require paving with asphalt.

The area that would be capped by concrete floors at the Building 12 Property covers approximately 13,000 square feet. The area that would be capped with asphalt at the Building 12 Property covers approximately 5,900 square feet. The area that would be capped with asphalt at the Building 13 Property covers approximately 800 square feet.

Remedial Investigation studies show that the contamination at the site is limited to a depth of <5 to 7 feet. The contaminants remaining above the identified cleanup concentrations are mostly present in clayey silt, restricting further migration of the contaminants. Ground water levels fluctuate which is a potential contaminant migration pathway if a rise in the water table contacts remaining contaminants. This is not likely to occur in the areas targeted for remediation as the shallowest depth to ground water historically measured in the monitoring wells at the

Klockner Property (see Attachment 2) has not been less than approximately 11 feet below grade while the soil contamination is present at depths <5 to 7 feet below grade.

The most common Institutional Control used for site remediation is a Deed Notice. Under this scenario, a Deed Notice notifying of the presence of soil contamination, requirements for maintaining any engineering controls and any restrictions on property use and disturbing contaminated soils would be imposed. A deed notice would identify requirements for monitoring to ensure that the conditions described therein are met to prevent potential exposure risks.

Cost: There would be a limited amount of capital or operating and maintenance cost for this alternative. Monitoring costs would continue for an extended period of time. Although the frequency of any necessary sampling would decrease over time, total monitoring costs could be substantial. Enforcement (maintenance) of the Deed Notice would be triggered when a property is sold or when construction permits or utility services are sought.

Time: Concentrations of TCE and PCE would remain above the remedial goals for at least as long as under the No Action alternative, perhaps longer since infiltration will be reduced. The operation and maintenance required under Alternative V2 would be ongoing.

6.1.1.3 Alternative V3: Excavation and Off-Site Disposal with Capping and Access and Use Restrictions

Alternative V3 is a combination of Excavation and Off-Site Disposal with Access and Use Restrictions, and Capping. Under this alternative, the TCE and PCE contaminated soil areas present at paved and unpaved areas outside the building structures would be excavated and disposed of off-site. The excavation of the TCE and PCE contaminated soil areas beneath Building 12 would be difficult as well as disruptive to the facility operations. Therefore, the TCE and PCE contaminated soil areas remaining beneath Building 12 would be capped. A Deed Notice would be filed with the appropriate authorities and interested parties identifying access and use restrictions associated with the contamination remaining beneath Building 12.

The TCE and PCE contaminated soil areas include the asphalt paved areas outside Building 12 as well as soil under the foot print of Building 12. PCE contaminated soil is present at an unpaved area at the Building 13 Property. The unpaved and asphalt paved areas are accessible for excavation with minimal disruption of the business operations at the site. The contaminated soils present outside the foot print of Building 12 and the contaminated soil present at the Building 13 Property would be excavated and transported to off-site disposal facilities. The type of facility (hazardous, non hazardous, pretreatment required) that the excavated soils would be disposed of at would depend on how the waste is characterized.

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TCE and PCE contaminated soil will remain beneath Building 12 after the excavation and off-site disposal of contaminated soil outside Building 12 is conducted. Capping and Access and Use Restrictions would be used to address the remaining soil contamination. The cap would consist of the building floor which will prevent the infiltration of water through the contaminated soil although some infiltration may occur. A Deed Notice would be filed with the appropriate authorities and interested parties identifying the access and use restrictions.

The area that would be capped by concrete floors at the Building 12 Property covers approximately 13,000 square feet. The area that would be excavated at the Building 12 Property covers approximately 5,900 square feet and approximately 1,300 cubic yards of soil would be generated for off-site disposal. The area that would be excavated at the Building 13 Property covers approximately 800 square feet and approximately 150 cubic yards of soil would be generated for off-site disposal.

Remedial Investigation studies show that the contamination at the site is limited to a depth of <5 to 7 feet. The contaminants remaining above the identified cleanup concentrations are mostly present in clayey silt, restricting further migration of the contaminants. Ground water levels fluctuate which is a potential contaminant migration pathway if a rise in the water table contacts remaining contaminants. This is not likely to occur in the areas targeted for remediation as the shallowest depth to ground water historically measured in the monitoring wells at the Klockner Property (see Attachment 2) has not been less than approximately 11 feet below grade while the soil contamination is present at depths <5 to 7 feet below grade.

A Deed Notice notifying of the presence of soil contamination, requirements for maintaining any engineering controls and any restrictions on property use and disturbing contaminated soils would be imposed. A Deed Notice would identify requirements for monitoring to ensure that the conditions described therein are met to prevent potential exposure risks.

Cost: There would be a low to moderate amount of capital or operating and maintenance cost for this alternative including restoration of excavated areas and continued operation and maintenance of the cap covering the TCE and PCE contaminated soil located below the building foot print. Monitoring costs would be eliminated for TCE and PCE in the excavated area only. Disposal costs could be moderate to high depending on how the excavated soils are characterized for disposal.

Time: Concentrations of TCE and PCE would be immediately reduced below clean-up goals in the excavated areas. Concentration of TCE and PCE would remain above cleanup levels under the foot print of the building.

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6.1.1.4 Alternative V4: Soil Vapor Extraction with Limited Excavation and Off-Site Disposal, and Capping and Access and Use Restrictions

Alternative V4 is a combination of SVE with Limited Excavation and Off-Site Disposal with Access and Use Restrictions, and Capping. Under this alternative, SVE would be used to treat the TCE and PCE soil contamination present at Building 12. The PCE contaminated soil at Building 13 would be excavated and disposed off-site. Any TCE or PCE soil contamination potentially remaining above the RAOs after SVE is conducted would be capped with existing concrete or pavement. A Deed Notice would be filed with the appropriate authorities and interested parties identifying access and use restrictions associated with the contamination remaining.

SVE can be instituted with the least disruption of the established use of the Klockner Property. SVE is a cost effective process option that would achieve the remediation objective. SVE is a presumptive technology that is proven to be effective for solvents such as TCE and PCE.

SVE will remove some of the contamination; the residual contamination bound up in the less permeable soil (silty clay) will be addressed with a combination of Capping and Access and Use Restrictions as detailed under Alternatives V2 and V3.

Excavation and Off-site Disposal would be used to remediate the PCE contaminated soil present at the Building 13 Property. This area is accessible for excavation with minimal disruption of the business operations at the site. The PCE contaminated soil present at the Building 13 Property would be excavated and transported to off-site disposal facilities. The type of facility (hazardous, non hazardous, pretreatment required) that the excavated soils would be disposed of at would depend on how the waste is characterized.

The area that would be treated using SVE at the Building 12 Property covers approximately 18,900 square feet. The area that would be excavated at the Building 13 Property covers approximately 800 square feet and approximately 150 cubic yards of soil would be generated for off-site disposal.

Cost: There would be a low to moderate amount of capital or operating and maintenance cost for this alternative. Disposal costs would be low to moderate depending on how the excavated soils are characterized for disposal. Monitoring costs would be eliminated for TCE and PCE in the excavated area only. There would be additional costs associated with the continued operation and maintenance of a cap over any TCE or PCE soil contamination potentially remaining above the RAOs after SVE is conducted.

Time: Concentrations of PCE would be immediately reduced below RAOs in the excavated areas. Concentrations of TCE and PCE would decrease significantly in the initial phase of the SVE operation. The period of time required to achieve the applicable RAOs would depend upon various factors. Additional evaluation and pilot study is necessary to determine when the applicable cleanup standard will be achieved under this alternative. Residual concentrations of TCE and PCE could remain above RAOs and would be addressed by Capping and Access and Use Restrictions.

6.1.1.5 Alternative 5: Chemical Oxidation with Soil Vapor Extraction with Limited Excavation and Off-Site Disposal, and Capping and Access and Use Restrictions

Alternative V5 is a combination of Chemical Oxidation with SVE with Limited Excavation and Off-Site Disposal with Access and Use Restrictions, and Capping. Under this alternative, Chemical Oxidation by ozone injection with possible SVE to control the flow of ozone through the contaminated soil would be used to treat the TCE and PCE soil contamination present at Building 12. The PCE contaminated soil at Building 13 would be excavated and disposed off-site. Any TCE or PCE soil contamination potentially remaining above the RAOs after Chemical Oxidation with SVE is conducted would be capped with existing concrete or pavement. A Deed Notice would be filed with the appropriate authorities and interested parties identifying access and use restrictions associated with the contamination remaining.

Chemical Oxidation with SVE can be instituted with the slightly more disruptive than SVE alone of the established use of the Klockner Property. Chemical Oxidation with SVE is a cost effective process option that would achieve the remediation objective. SVE itself is a presumptive technology that is proven to be effective for solvents such as TCE and PCE.

Chemical Oxidation with SVE will remove some of the contamination; the residual contamination bound up in the less permeable soil (silty clay) will be addressed with a combination of Capping and Access and Use Restrictions as detailed under Alternatives V2 and V3.

Excavation and Off-site Disposal would be used to remediate the PCE contaminated soil present at the Building 13 Property. This area is accessible for excavation with minimal disruption of the business operations at the site. The PCE contaminated soil present at the Building 13 Property would be excavated and transported to off-site disposal facilities. The type of facility (hazardous, non hazardous, pretreatment required) that the excavated soils would be disposed of at would depend on how the waste is characterized.

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The area that would be treated using Chemical Oxidation with SVE at the Building 12 Property covers approximately 18,900 square feet. The area that would be excavated at the Building 13 Property covers approximately 800 square feet and approximately 150 cubic yards of soil would be generated for off-site disposal.

Cost: There would be a moderate amount of capital or operating and maintenance cost for this alternative. Disposal costs would be low to moderate depending on how the excavated soils are characterized for disposal. Monitoring costs would be eliminated for TCE and PCE in the excavated area only. There would be additional costs associated with the continued operation and maintenance of a cap over any TCE or PCE soil contamination potentially remaining above the RAOs after SVE is conducted.

Time: Concentrations of PCE would be immediately reduced below RAOs in the excavated areas. Concentrations of TCE and PCE would decrease significantly in the initial phase of the Chemical Oxidation with SVE operation. The period of time required to achieve the applicable RAOs would depend upon various factors. Additional evaluation and pilot study is necessary to determine when the applicable cleanup standard will be achieved under this alternative. Residual concentrations of TCE and PCE could remain above RAOs and would be addressed by Capping and Access and Use Restrictions.

6.1.2 Description of Remedial Alternatives for Lead

The retained remedial technologies and process options used to form the remedial alternatives for lead described below include:

- No action
- Access and Use Restrictions – Deed Restrictions
- Capping – Asphalt and Concrete
- Excavation and Off-site Disposal

The following remedial alternatives were formulated using the above listed remedial technologies and process options.

- Alternative L1: No Action
- Alternative L2: Access and Use Restrictions, and Capping
- Alternative L3: Excavation and Off-Site Disposal

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6.1.2.1 Alternative L1: No Action

The No Action Alternative (Alternative L1) would not actively control, treat, or monitor the contamination in soil. lead in soil would migrate and dissipate. The No Action Alternative is retained for consideration in accordance with the NCP.

Cost: There would be no capital or operating, maintenance, or monitoring cost for this alternative. It would be the least expensive alternative.

Time: Concentrations of lead would remain above clean-up goals for an indeterminate time.

6.1.2.2 Alternative L2: Access and Use Restrictions, and Capping

Alternative L2 is a combination of Access and Use Restrictions, and Capping. Under this alternative, the lead contaminated soil area would be capped with asphalt or concrete. A Deed Notice would be filed with the appropriate authorities and interested parties identifying the access and use restrictions.

A cap prevents migration of the contaminants and prevents it from acting as a source. The primary route of contaminant migration from the soil to the ground water is typically through the movement of water through the soil column. If water is prevented from percolating through the contaminated soil, further migration could be prevented or limited. The presence of asphalt paved surface over the area of lead soil contamination at the Building 12 Property will prevent the infiltration of water through the contaminated soil although some infiltration may occur (i.e. through damaged pavement).

The area of lead soil contamination that would be capped with asphalt at the Building 12 Property covers approximately 360 square feet.

Remedial Investigation studies show that the lead soil contamination at the site is limited to a depth of <2 feet. The contaminants remaining above the identified cleanup concentrations are mostly present in clayey silt, restricting further migration of the contaminants. Ground water levels fluctuate which is a potential contaminant migration pathway if a rise in the water table contacts remaining contaminants. This is not likely to occur in the areas targeted for remediation as the shallowest depth to ground water historically measured in the monitoring wells at the Klockner Property (see Attachment 2) has not been less than approximately 11 feet below grade while the soil contamination is present at depths <2 feet below grade.

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The most common Institutional Control used for site remediation is a Deed Notice. Under this scenario, a Deed Notice notifying of the presence of soil contamination, requirements for maintaining any engineering controls and any restrictions on property use and disturbing contaminated soils would be imposed. A deed notice would identify requirements for monitoring to ensure that the conditions described therein are met to prevent potential exposure risks.

Cost: There would be a limited amount of capital or operating and maintenance cost for this alternative. Monitoring costs would continue for an extended period of time. Total monitoring costs could be substantial over time. Enforcement (maintenance) of the Deed Notice would be triggered when a property is sold or when construction permits or utility services are sought.

Time: Concentrations of lead would remain above the remedial goals for at least as long as under the No Action alternative, perhaps longer since infiltration will be reduced. The operation and maintenance required under Alternative 2 would be ongoing.

6.1.2.3 Alternative L3: Excavation and Off-Site Disposal

Alternative L3 is a combination of Excavation and Off-Site Disposal. Under this alternative, the lead contaminated soil area would be excavated and disposed of off-site.

The lead contaminated soil area is located in the paved area near the Building 12 alleyway. This area is accessible for excavation with minimal disruption of the business operations at the site. The lead contaminated soils would be excavated and transported to an off-site disposal facility. The type of facility (hazardous, non hazardous, pretreatment required) that the excavated soils would be disposed of at would depend on how the waste is characterized.

The lead contaminated soil area that would be excavated at the Building 12 Property covers approximately 360 square feet and approximately 27 cubic yards of soil would be generated for off-site disposal.

Cost: There would be a low amount of capital or operating and maintenance cost for this alternative. Disposal costs would be low.

Time: Concentrations of lead would be immediately reduced below clean-up goals in the excavated areas.

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7.0 CONCLUSION

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7.1 TCE and PCE Soil Contamination

This Third Amended Technical Memorandum for Development and Screening of Alternatives for Site Remediation has systematically evaluated all identified GRAs, remedial technologies and process options to arrive at the remedial alternatives for a comprehensive response to the OU3 soil contamination. Six remedial technologies were retained for the TCE and PCE soil contamination through the screening process and included No Action, Access and Use Restrictions, Caps, Excavation, In-situ Treatment (Soil Vapor Extraction or Chemical Oxidation), and Off-site Disposal. These retained remedial technologies were then used to develop five remedial alternatives. The five remedial alternatives developed include:

- Alternative 1: No Action
- Alternative 2: Access and Use Restrictions, and Capping
- Alternative 3: Excavation and Off-Site Disposal with Capping and Access and Use Restrictions
- Alternative 4: Soil Vapor Extraction with Excavation and Off-Site Disposal, and Capping and Access and Use Restrictions
- Alternative 5: Chemical Oxidation with Soil Vapor Extraction with Excavation and Off-Site Disposal, and Capping and Access and Use Restrictions

A detailed evaluation of the five remedial alternatives for the TCE and PCE soil contamination will be conducted under the Feasibility Study.

7.2 Lead Soil Contamination

This Third Amended Technical Memorandum for Development and Screening of Alternatives for Site Remediation has systematically evaluated all identified GRAs, remedial technologies and process options to arrive at the remedial alternatives for a comprehensive response to the OU3 soil contamination. Five remedial technologies were retained for the lead soil contamination through the screening process and included No Action, Access and Use Restrictions, Caps, Excavation, and Off-site Disposal. These retained remedial technologies were then used to develop three remedial alternatives. The three remedial alternatives developed include:

- Alternative 1: No Action
- Alternative 2: Access and Use Restrictions, and Capping
- Alternative 3: Excavation and Off-Site Disposal

A detailed evaluation of the three remedial alternatives for the lead soil contamination will be conducted under the Feasibility Study.

8.0 REFERENCES

Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA Interim Final EPA/540/G-89/004 OSWER Directive 9355.3-01 October 1988

User Guide to the VOCs in Soils. Presumptive Remedy (EPA, 1996).EPA Document No. 540-F-96-008

Guide for Conducting Treatability Studies Under CERCLA: Soil Vapor Extraction Interim Guidance, EPA/540/2-91/019A September 1991

Feasibility Study Analysis for CERCLA Municipal Landfill Sites, EPA 5540/R-94/081, August 1994

Federal Remediation Technologies Roundtable (FRTR), Remediation Technologies Screening Matrix & Reference Guide, Version 4.0

Environmental Security Technology Certification Program Impact of Landfill Closure Design on Long Term Attenuation of Chlorinated Hydrocarbons, March 2002

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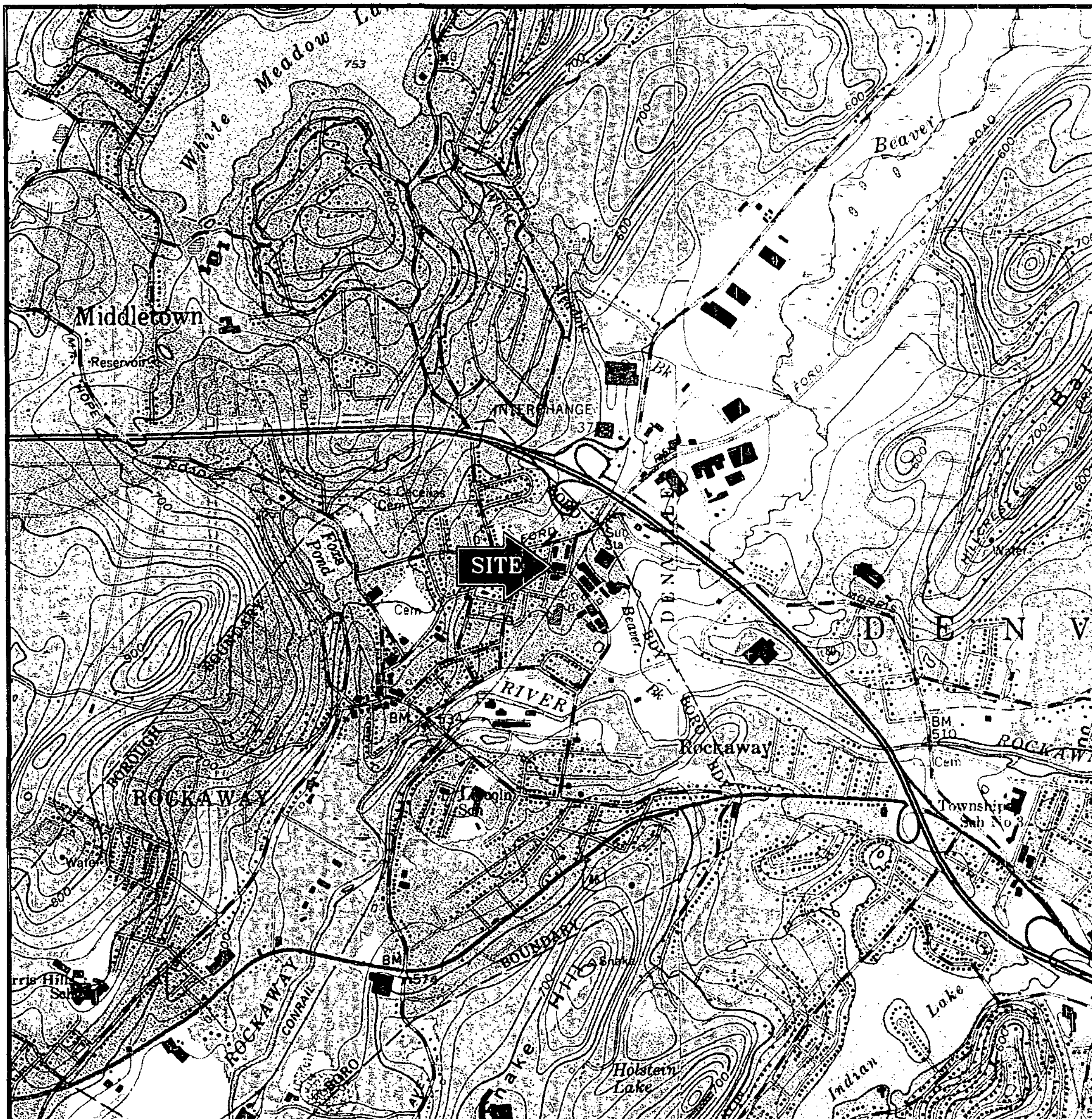

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.5 — .25 — 0 — .5 KILOMETER

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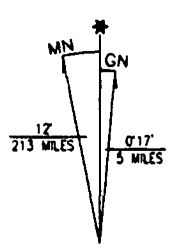
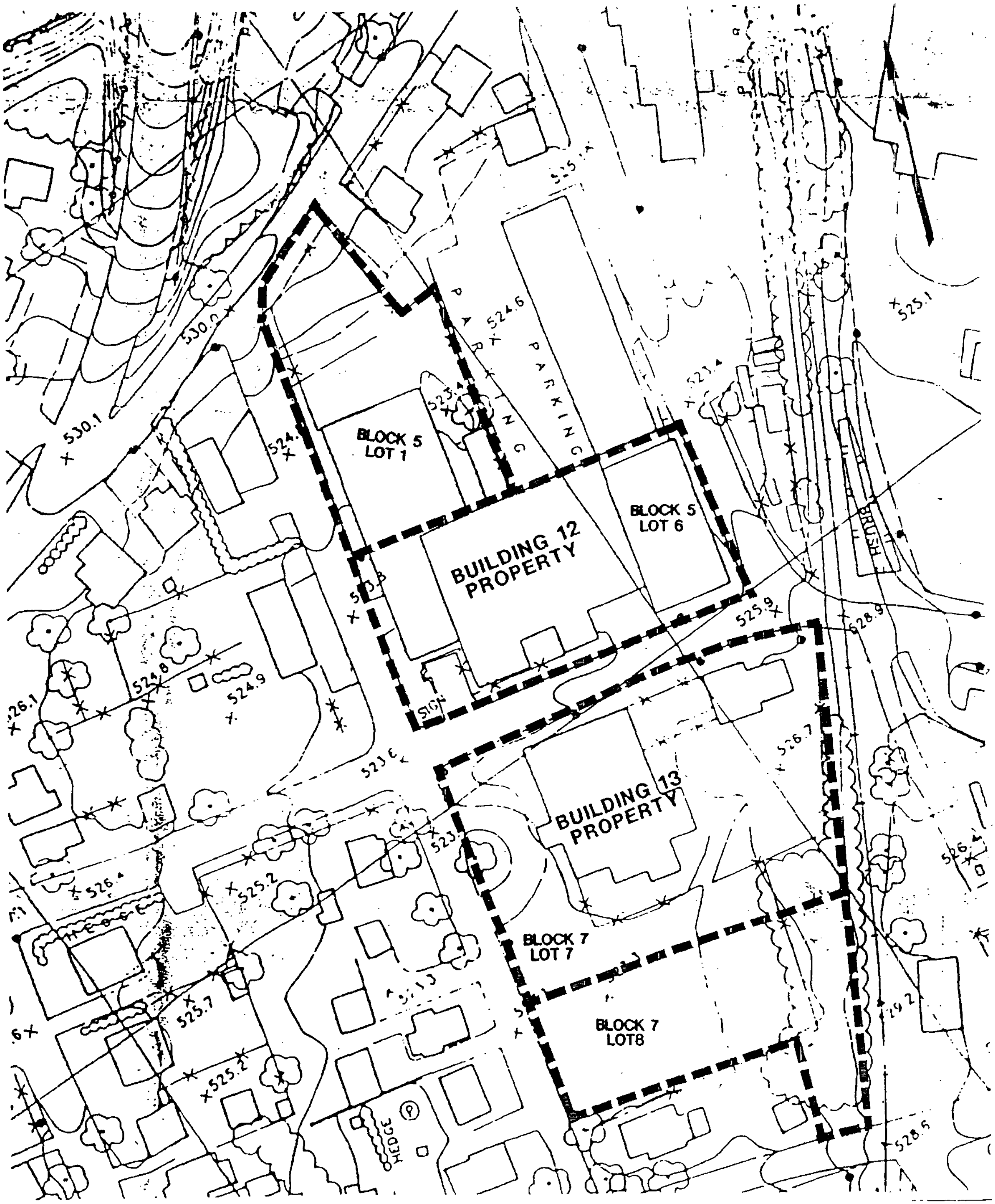


UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

QUADRANGLE LOCATION

THE WHITMAN Companies, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NEW JERSEY SITE LOCATION ON USGS DOVER, N.J. QUADRANGLE	
ORIGINAL BY: M.M.	DRAWN BY: R.R.	DRAWING NO: 950302MAP
CHECKED BY: M.M.	DATE: APRIL 2006	FIGURE NO: 1



SOURCE:

AERIAL SURVEY DATED JUNE 1994 PREPARED BY ROBINSON AERIAL SURVEY'S INC. FOR CONESTOGA-ROVERS & ASSOCIATES

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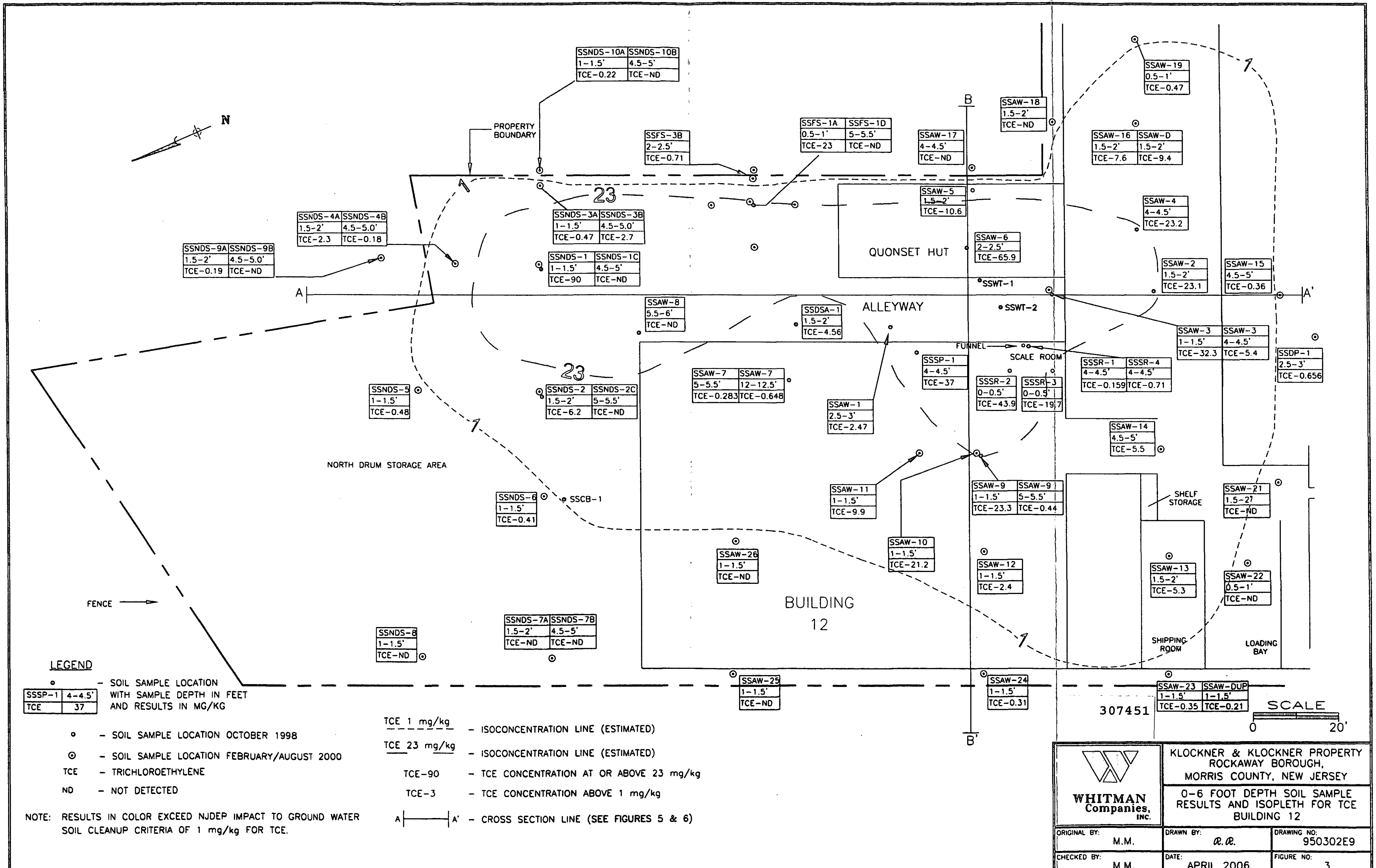
THE WHITMAN CompanieS, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NEW JERSEY SITE MAP OF KLOCKNER PROPERTY	
ORIGINAL BY: L.Z.	DRAWN BY: R.R.	DRAWING NO: 950302X9
CHECKED BY: B.U.	DATE: FEB. 2005	FIGURE NO: 2



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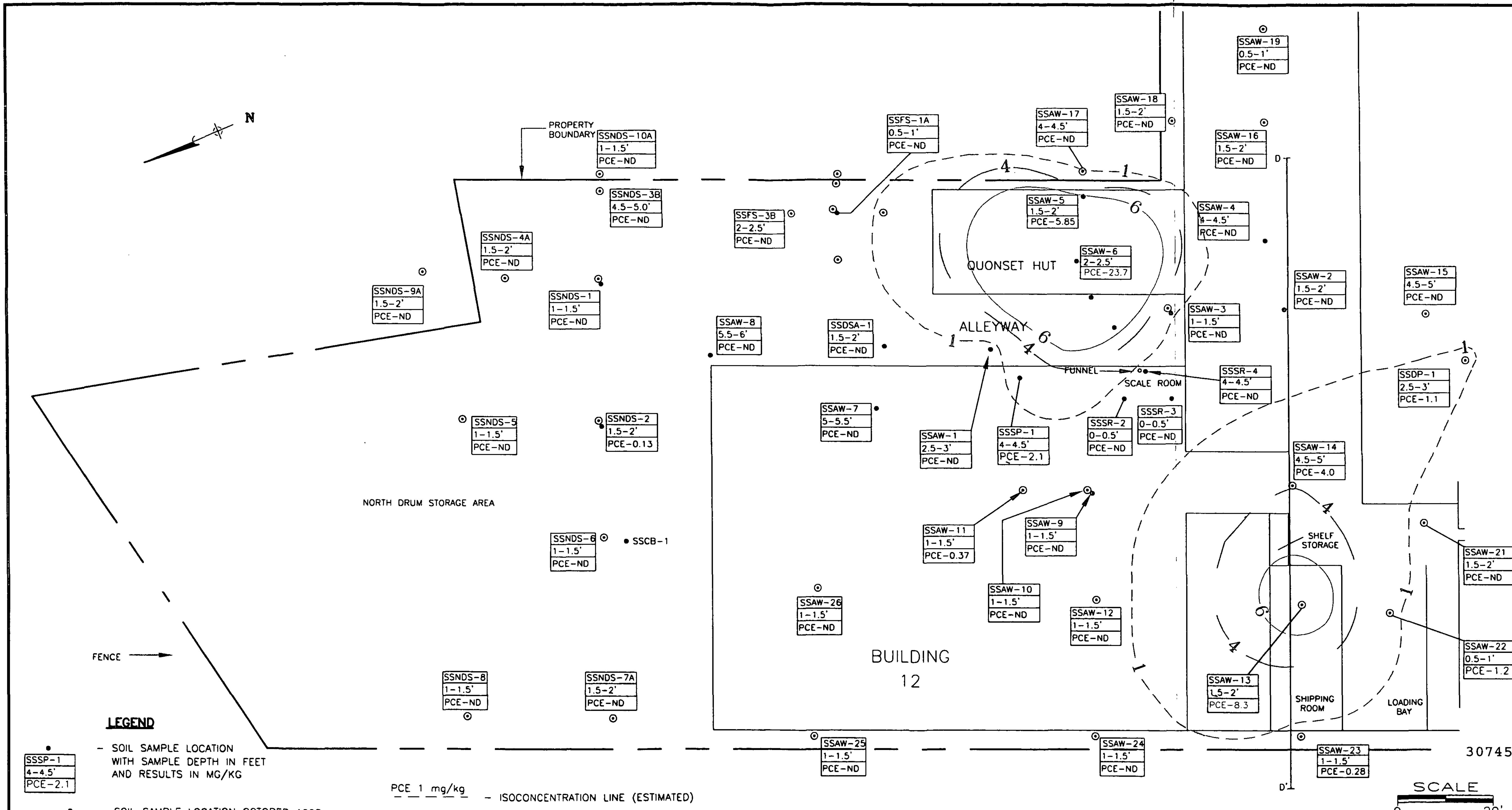
PROPERTY BOUNDARY
SSNDS-10A 1-1.5' TCE-0.22
SSNDS-10B 4.5-5' TCE-ND
SSFS-3B 2-2.5' TCE-0.71
SSFS-1A 0.5-1' TCE-23
SSFS-1D 5-5.5' TCE-ND
SSAW-17 4-4.5' TCE-ND
SSAW-18 1.5-2' TCE-ND
SSAW-19 0.5-1' TCE-0.47
SSAW-16 1.5-2' TCE-7.6
SSAW-D 1.5-2' TCE-9.4
SSAW-5 1.5-2' TCE-10.6
SSAW-4 4-4.5' TCE-23.2
SSNDS-4A 1.5-2' TCE-2.3
SSNDS-4B 4.5-5.0' TCE-0.18
SSNDS-3A 1-1.5' TCE-0.47
SSNDS-3B 4.5-5.0' TCE-2.7
SSNDS-9A 1.5-2' TCE-0.19
SSNDS-9B 4.5-5.0' TCE-ND
SSNDS-1 1-1.5' TCE-90
SSNDS-1C 4.5-5' TCE-ND
23
QUONSET HUT
SSAW-6 2-2.5' TCE-65.9
SSWT-1
SSAW-2 1.5-2' TCE-23.1
SSAW-15 4.5-5' TCE-0.36
A
A'
SSAW-8 5.5-6' TCE-ND
SSDSA-1 1.5-2' TCE-4.56
ALLEYWAY
SSWT-2
SSAW-3 1-1.5' TCE-32.3
SSAW-3 4-4.5' TCE-5.4
FUNNEL
SCALE ROOM
SSDP-1 2.5-3' TCE-0.656
SSSP-1 4-4.5' TCE-37
SSSR-1 4-4.5' TCE-0.159
SSSR-4 4-4.5' TCE-0.71
SSAW-7 5-5.5' TCE-0.283
SSAW-7 12-12.5' TCE-0.648
SSSR-2 0-0.5' TCE-43.9
SSSR-3 0-0.5' TCE-19.7
SSNDS-5 1-1.5' TCE-0.48
23
SSNDS-2 1.5-2' TCE-6.2
SSNDS-2C 5-5.5' TCE-ND
SSAW-1 2.5-3' TCE-2.47
SSAW-14 4.5-5' TCE-5.5
1
NORTH DRUM STORAGE AREA
SSAW-11 1-1.5' TCE-9.9
SSAW-9 1-1.5' TCE-23.3
SSAW-9 5-5.5' TCE-0.44
SHELF STORAGE
SSAW-21 1.5-2' TCE-ND
SSNDS-6 1-1.5' TCE-0.41
SSCB-1
SSAW-10 1-1.5' TCE-21.2
SSAW-26 1-1.5' TCE-ND
SSAW-12 1-1.5' TCE-2.4
SSAW-13 1.5-2' TCE-5.3
SSAW-22 0.5-1' TCE-ND
FENCE
BUILDING 12
SSNDS-8 1-1.5' TCE-ND
SSNDS-7A 1.5-2' TCE-ND
SSNDS-7B 4.5-5' TCE-ND
SHIPPING ROOM
LOADING BAY
SSAW-25 1-1.5' TCE-ND
SSAW-24 1-1.5' TCE-0.31
SSAW-23 1-1.5' TCE-0.35
SSAW-DUP 1-1.5' TCE-0.21
B
B'
307451
SCALE
0
20'
LEGEND
SOIL SAMPLE LOCATION WITH SAMPLE DEPTH IN FEET AND RESULTS IN MG/KG
SSSP-1 4-4.5' TCE 37
- SOIL SAMPLE LOCATION OCTOBER 1998
- SOIL SAMPLE LOCATION FEBRUARY/AUGUST 2000
TCE - TRICHLOROETHYLENE
ND - NOT DETECTED
TCE 1 mg/kg - ISOCONCENTRATION LINE (ESTIMATED)
TCE 23 mg/kg - ISOCONCENTRATION LINE (ESTIMATED)
TCE-90 - TCE CONCENTRATION AT OR ABOVE 23 mg/kg
TCE-3 - TCE CONCENTRATION ABOVE 1 mg/kg
A A' - CROSS SECTION LINE (SEE FIGURES 5 & 6)
NOTE: RESULTS IN COLOR EXCEED NJDEP IMPACT TO GROUND WATER SOIL CLEANUP CRITERIA OF 1 mg/kg FOR TCE.
WHITMAN Companies, INC.
KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH, MORRIS COUNTY, NEW JERSEY
0-6 FOOT DEPTH SOIL SAMPLE RESULTS AND ISOPLETH FOR TCE BUILDING 12
ORIGINAL BY: M.M.
DRAWN BY: R.R.
DRAWING NO: 950302E9
CHECKED BY: M.M.
DATE: APRIL 2006
FIGURE NO: 3



LEGEND

SSSP-1 4-4.5' PCE-2.1 – SOIL SAMPLE LOCATION WITH SAMPLE DEPTH IN FEET AND RESULTS IN MG/KG

- • – SOIL SAMPLE LOCATION OCTOBER 1998
- ⊙ – SOIL SAMPLE LOCATION FEBRUARY/AUGUST 2000
- PCE – TETRACHLORETHYLENE
- ND – NOT DETECTED

NOTE:

RESULTS IN COLOR EXCEED NJDEP IMPACT TO GROUND WATER SOIL CLEANUP CRITERIA OF 1 mg/kg FOR PCE

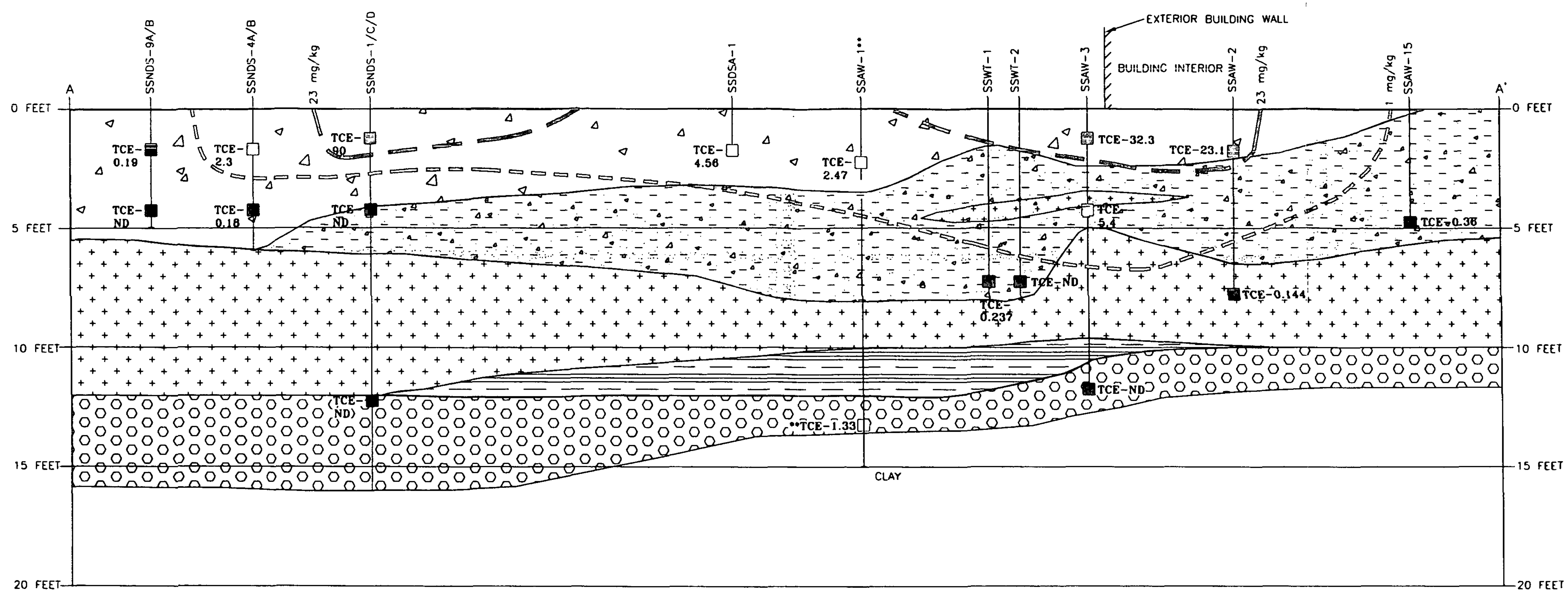
- PCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)
- PCE 4 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)
- PCE 6 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)
- PCE-3 – PCE CONCENTRATION ABOVE 1 mg/kg
- PCE-5 – PCE CONCENTRATION AT OR ABOVE 4 mg/kg
- PCE-10 – PCE CONCENTRATION AT OR ABOVE 6 mg/kg
- D—D' – CROSS SECTION LINE (SEE FIGURE 12)

WHITMAN Companies, INC.

KLOCKNER & KLOCKNER PROPERTY
ROCKAWAY BOROUGH,
MORRIS COUNTY, NEW JERSEY

0-6 FOOT DEPTH SOIL SAMPLE RESULTS AND ISOPLETH FOR PCE BUILDING 12

ORIGINAL BY: M.M.	DRAWN BY: R.R.	DRAWING NO: 950302F7
CHECKED BY: M.M.	DATE: APRIL 2006	FIGURE NO: 4



LEGEND

SSAW-3 — SOIL SAMPLE LOCATION WITH RESULTS IN MG/KG (TCE-32.3)

TCE 1 mg/kg — ISOCONCENTRATION LINE (ESTIMATED)

TCE 23 mg/kg — ISOCONCENTRATION LINE (ESTIMATED)

- SILTY SAND AND GRAVEL
- SILTY FINE SAND
- SILTY CLAY WITH SAND AND SOME GRAVEL
- SILTY CLAY WITH SAND
- MEDIUM SAND

NOTE:
SEE FIGURE 3 FOR CROSS SECTION LOCATION

TCE — TRICHLOROETHYLENE
ND — NOT DETECTED

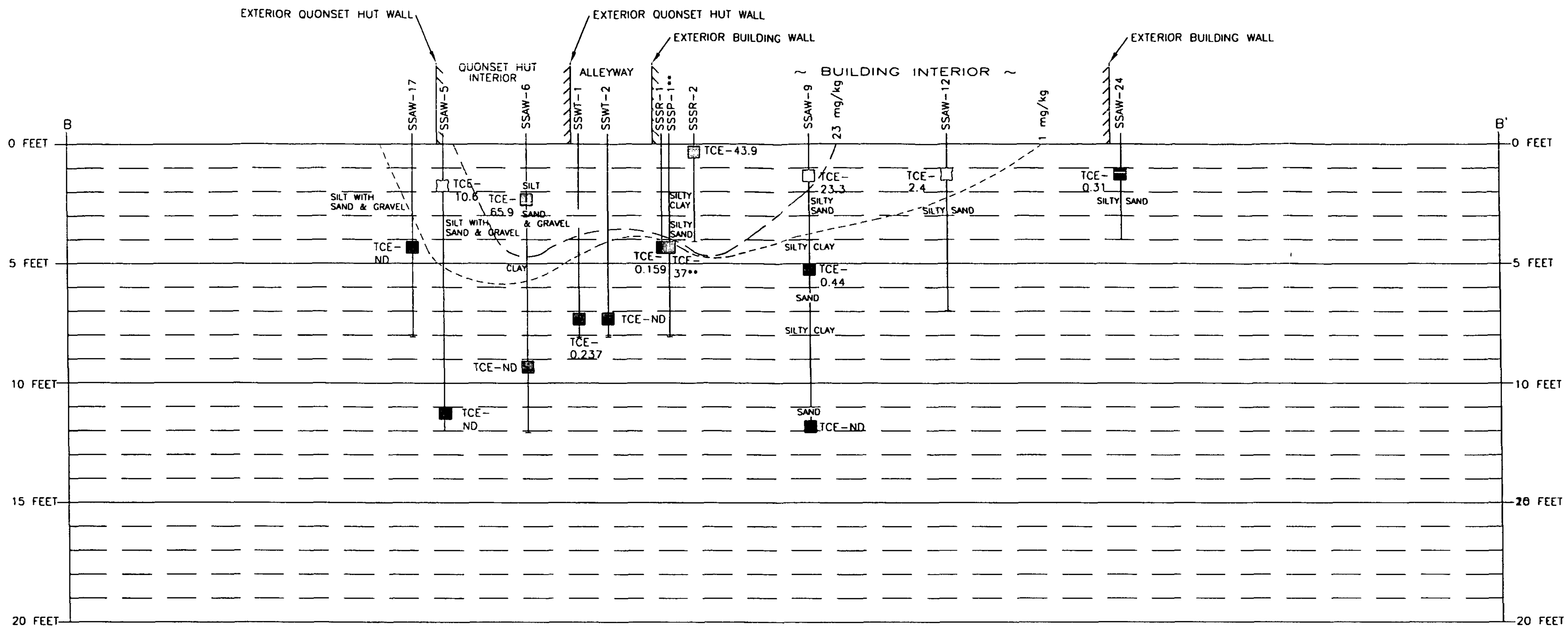
0 20'
HORIZONTAL SCALE

0 5'
VERTICAL SCALE

307453

** - THE TCE RESULT FOR SAMPLE SSAW-1 WAS NOT USED IN THE PREPARATION OF THE ISOCONCENTRATION LINES AS IT APPEARS TO BE AN ANOMALY. THE CONCENTRATION OF TCE DETECTED (1.33 mg/kg) WAS JUST ABOVE ITS REMEDIAL ACTION GOAL OF 1 mg/kg. THE RESULTS FOR SAMPLING IN THIS AREA INDICATE THAT THE TCE SOIL CONTAMINATION IS PRESENT ABOVE THE REMEDIAL ACTION GOAL IN THE SHALLOW (FIRST 5 TO 7 FEET OF SOIL BELOW GRADE) SOIL WHICH CONSISTS OF A SILTY SAND AND GRAVEL LAYER. OTHER DEEPER SAMPLE LOCATIONS IN THIS AREA INDICATED A SIGNIFICANT DROP OFF (1 TO 2 ORDERS OF MAGNITUDE OR TO NONE DETECTED) IN TCE CONCENTRATIONS WITH DEPTH. PRE-REMEDIATION SAMPLING WILL BE CONDUCTED FROM THIS AREA TO FURTHER INVESTIGATE THIS ANOMALY.

WHITMAN Companies, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH, MORRIS COUNTY, NEW JERSEY		
	CROSS SECTION A-A' BUILDING 12 TCE RESULTS		
ORIGINAL BY: M.M.	DRAWN BY: R.R.	DRAWING NO: 950302G4	
CHECKED BY: M.M.	DATE: APRIL 2006	FIGURE NO: 5	



LEGEND

SSAW-4 TCE-23.2 - SOIL SAMPLE LOCATION WITH RESULTS IN MG/KG

TCE 1 mg/kg - ISOCONCENTRATION LINE (ESTIMATED)

TCE 23 mg/kg - ISOCONCENTRATION LINE (ESTIMATED)

TCE-90 - TCE CONCENTRATION AT OR ABOVE 23 mg/kg

TCE-3 - TCE CONCENTRATION ABOVE 1 mg/kg

TCE - TRICHLOROETHYLENE

ND - NOT DETECTED

0 20'

HORIZONTAL SCALE

0 5'

VERTICAL SCALE

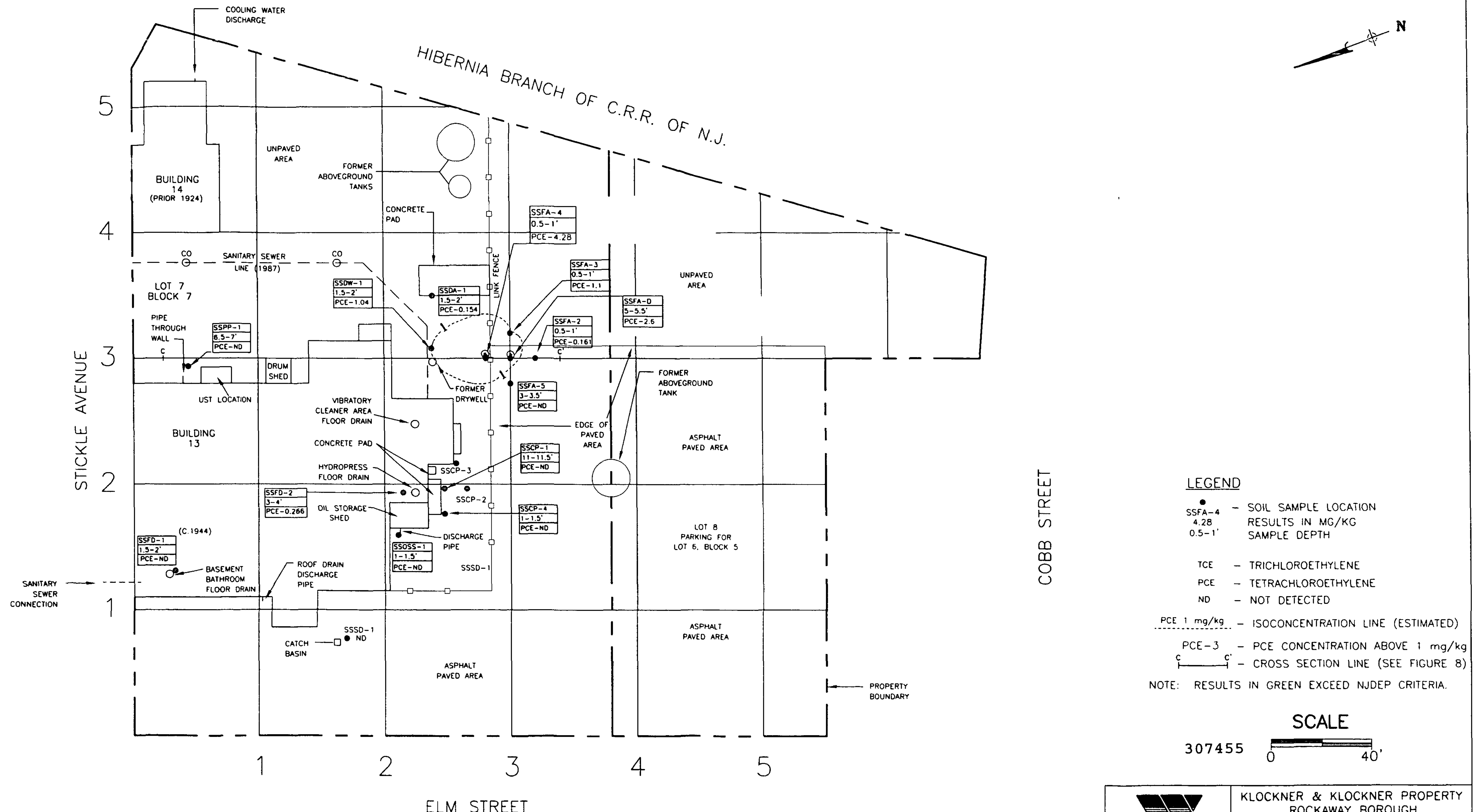
307454

NOTES:

1. SEE FIGURE 3 FOR CROSS SECTION LOCATION

** - THE TCE RESULT FOR THE SAMPLE SSSP-1 WAS NOT USED IN THE PREPARATION OF THE ISOCONCENTRATION LINES BECAUSE THE SAMPLE WAS COLLECTED FROM BELOW THE INVERT OF A SUMP AND IS AN ANOMALY WITH RESPECT TO THE PREPARATION OF THE ISOCONCENTRATION LINES FOR THE AREA WIDE CONTAMINATION. BASED ON THE CONTAMINANT TRENDS OBSERVED IN OTHER SAMPLES IN THIS AREA, IT IS EXPECTED THAT THE CONCENTRATION OF TCE BENEATH 4.5 FEET AT SSSP-1 DROPS TO BELOW THE REMEDIAL ACTION GOAL WITHIN SEVERAL FEET. THE CONTAMINATION IS ANTICIPATED TO BE LIMITED TO A SMALL HORIZONTAL AREA BELOW THE SUMP. PRE-REMEDIATION SOIL SAMPLING WILL BE CONDUCTED TO FURTHER INVESTIGATE THIS AREA.

WHITMAN Companies, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH, MORRIS COUNTY, NEW JERSEY CROSS SECTION B-B' BUILDING 12-TCE RESULTS	
ORIGINAL BY: M.M.	DRAWN BY: R.R.	DRAWING NO: 950302G5
CHECKED BY: M.M.	DATE: APRIL 2006	FIGURE NO: 6



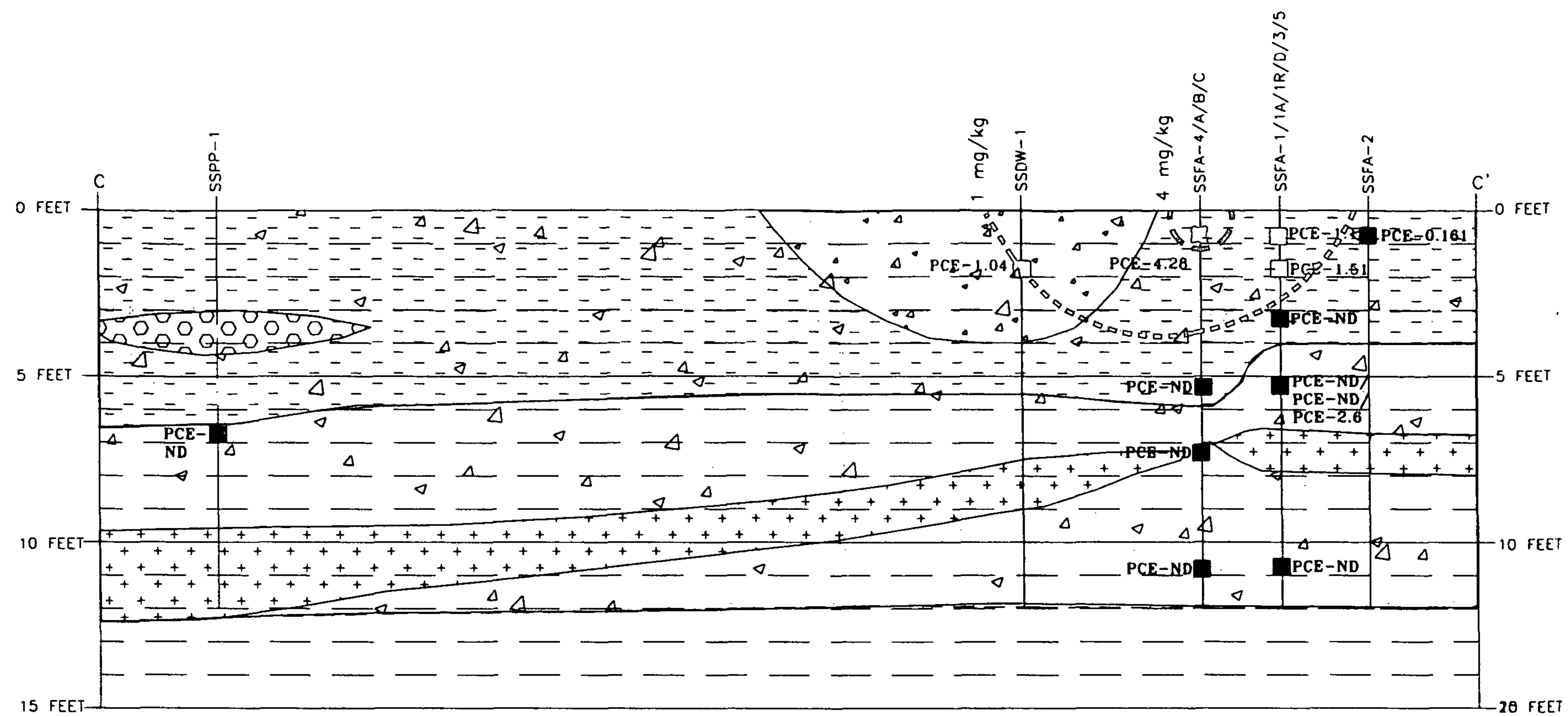
307455

THE WHITMAN CompanieS, INC.

KLOCKNER & KLOCKNER PROPERTY
ROCKAWAY BOROUGH
MORRIS COUNTY, NJ

0-6 FOOT SOIL SAMPLE RESULTS & ISOPLETH FOR PCE – BUILDING 13

ORIG. BY: B.U.	DWG. BY: R.R.	CHK. BY: B.U.
DWG.#: 950302F3	DATE: FEB. 2005	FIGURE: 7



LEGEND

SSFA-2 — SOIL SAMPLE LOCATION WITH RESULTS IN MG/KG

PCE-
0.161

PCE – TETRACHLOROETHYLENE

ND – NOT DETECTED

PCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE 4 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE-4.28 – PCE CONCENTRATION AT OR ABOVE 4 mg/kg

PCE-1.51 – PCE CONCENTRATION ABOVE 1 mg/kg

– SILTY SAND AND GRAVEL

– SILTY FINE SAND

– SILTY CLAY WITH SAND AND SOME GRAVEL

– GRAVEL

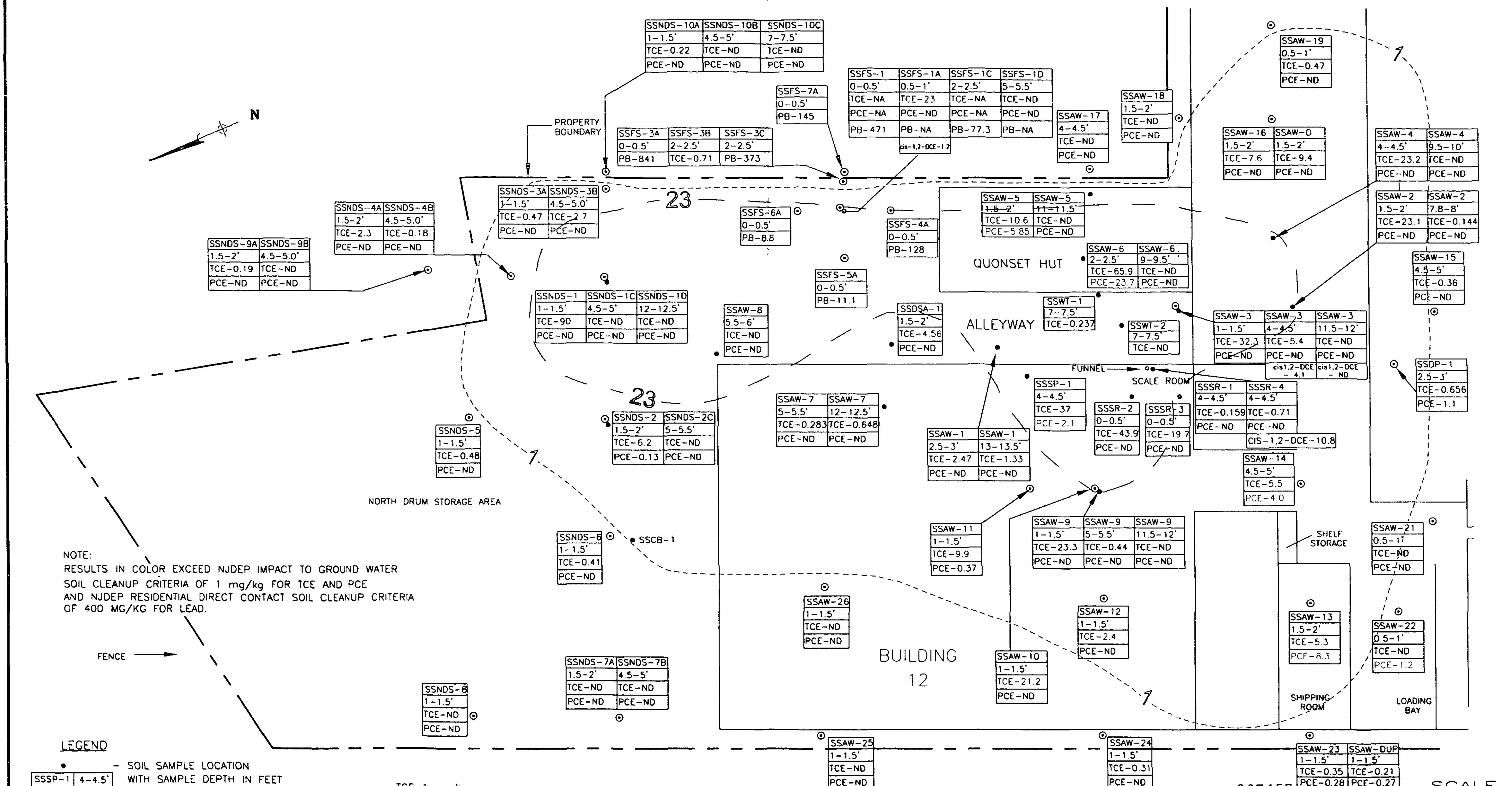
NOTE:
SEE FIGURE 7 FOR CROSS SECTION LOCATION

0 20'
HORIZONTAL SCALE

0 5'
VERTICAL SCALE

307456

THE WHITMAN CompanieS, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NEW JERSEY	
	CROSS SECTION C-C' BUILDING 13	
ORIGINAL BY: C.C.	DRAWN BY: CLC	DRAWING NO: 950302E5
CHECKED BY: M.M.	DATE: AUGUST 2004	FIGURE NO: 8



LEGEND

•		– SOIL SAMPLE LOCATION WITH SAMPLE DEPTH IN FEET AND RESULTS IN MG/KG
SSSP-1	4-4.5'	
TCE	37	

- ∘ – SOIL SAMPLE LOCATION OCTOBER 1998
- ⊙ – SOIL SAMPLE LOCATION FEBRUARY/AUGUST 2000
- TCE – TRICHLOROETHYLENE
- PCE – TETRACHLOROETHYLENE
- PB – LEAD
- CIS-1,2-DCE – CIS-1,2-DICHLOROETHENE
- ND – NOT DETECTED

- TCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)
- TCE 23 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)
- TCE-90 – TCE CONCENTRATION AT OR ABOVE 23 mg/kg
- TCE-3 – TCE CONCENTRATION ABOVE 1 mg/kg
- PB-450 – PB CONCENTRATION ABOVE 400 mg/kg
- PCE-3 – PCE CONCENTRATION ABOVE 1 mg/kg

NOTE:
ONLY RESULTS FOR TCE, PCE, AND PB ARE PLOTTED.
CIS-1,2-DCE INCLUDED WHERE CONCENTRATION EXCEEDS 1 mg/kg

307457

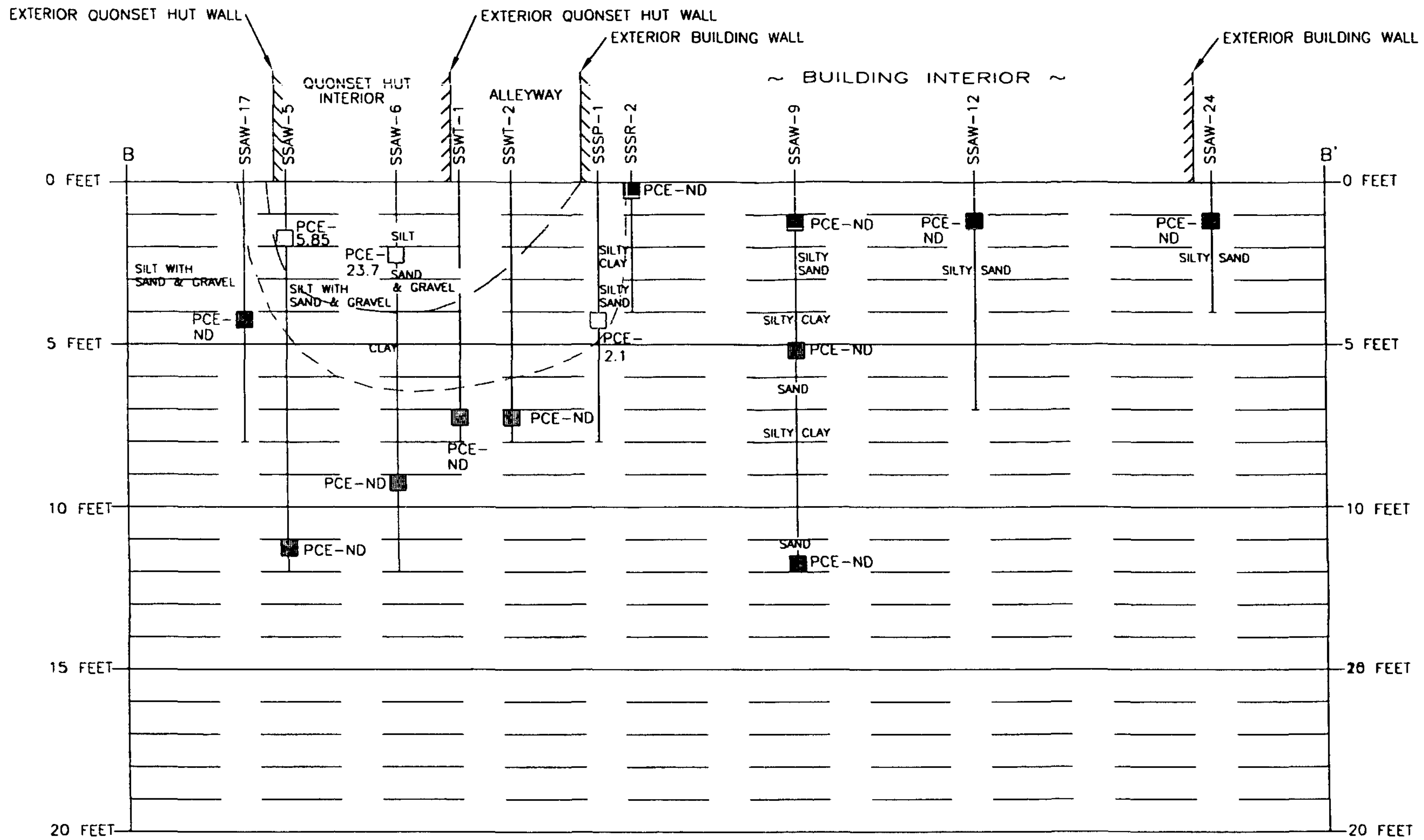
SCALE 0 20'

WHITMAN Companies, INC.

KLOCKNER & KLOCKNER PROPERTY
ROCKAWAY BOROUGH,
MORRIS COUNTY, NEW JERSEY

SOIL SAMPLE RESULTS AND SAMPLE LOCATIONS BUILDING 12

ORIGINAL BY: M.M.	DRAWN BY: R.R.	DRAWING NO: 950302G6
CHECKED BY: M.M.	DATE: APRIL 2006	FIGURE NO: 9



307458

LEGEND

SSAW-5 PCE-5.85 - SOIL SAMPLE LOCATION WITH RESULTS IN MG/KG

PCE 1 mg/kg - ISOCONCENTRATION LINE (ESTIMATED)

PCE 4 mg/kg - ISOCONCENTRATION LINE (ESTIMATED)

PCE-23.7 - PCE CONCENTRATION AT OR ABOVE 4 mg/kg

PCE-2.1 - PCE CONCENTRATION ABOVE 1 mg/kg

PCE - TETRACHLOROETHYLENE

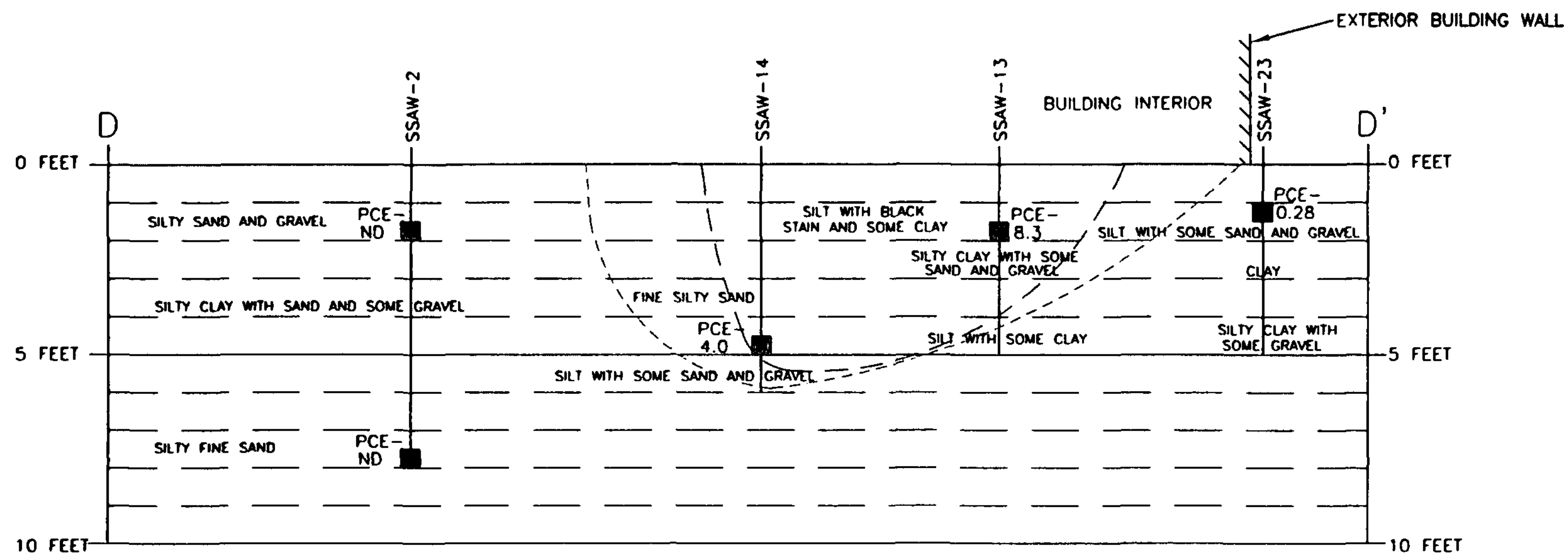
ND - NOT DETECTED

0 20' HORIZONTAL SCALE

0 5' VERTICAL SCALE

NOTE: SEE FIGURE 3 FOR CROSS SECTION LOCATION

WHITMAN Companies, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH, MORRIS COUNTY, NEW JERSEY	
	CROSS SECTION B-B' BUILDING 12-PCE RESULTS	
ORIGINAL BY: M.M.	DRAWN BY: R.R.	DRAWING NO: 950302F8
CHECKED BY: M.M.	DATE: APRIL 2006	FIGURE NO: 10



LEGEND

PCE 1 mg/kg - - - - - - ISOCONCENTRATION LINE (ESTIMATED)

PCE 4 mg/kg — — — — ISOCONCENTRATION LINE (ESTIMATED)

PCE-8.3 — PCE CONCENTRATION AT OR ABOVE 4 mg/kg

PCE — TETRACHLOROETHYLENE

ND — NOT DETECTED

SSAW-23 PCE-0.28 — SOIL SAMPLE LOCATION WITH RESULTS IN MG/KG

NOTE: SEE FIGURE 4 FOR CROSS SECTION LOCATION

307459

VERTICAL SCALE
0 5'

HORIZONTAL SCALE
0 20'

THE WHITMAN Companies, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NEW JERSEY
	CROSS SECTION D-D' BUILDING 12 - PCE RESULTS

ORIGINAL BY: L.Z.	DRAWN BY: R.R.	DRAWING NO: 950302F6
CHECKED BY: L.Z.	DATE: APRIL 2006	FIGURE NO: 11

1

307460

ATTACHMENT 1

EPA'S MARCH 14, 2006 LETTER

307461

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
290 BROADWAY
NEW YORK, NEW YORK 10007

MAR 1 4 2006

RECEIVED
20
Whitman Companies, Inc.

EXPRESS MAIL
RETURN RECEIPT REQUESTED

Mr. Michael Metlitz
116 Tices Lane
Unit B-1
East Brunswick, New Jersey 08816

Re: Second Amended Technical Memorandum for the Development and Screening of Alternatives for Site Remediation for the Rockaway Borough Wellfield Superfund Site, Morris County, New Jersey

Dear Mr. Metlitz:

The U.S. Environmental Protection Agency (EPA) and New Jersey Department of Environmental Protection (NJDEP) have reviewed the Whitman Companies' October 2005 Second Amended Technical Memorandum for the Development and Screening of Alternatives for Site Remediation for the Klockner and Klockner portion of the Rockaway Borough Wellfield site. Please address the enclosed NJDEP comments as well as the following EPA comments.

General Comments

The following comments provided previously do not appear to have been adequately addressed:

- **EPA General Comment** – *"A figure should be included that incorporates the depth to groundwater information in Attachment 1 to delineate the depth to groundwater…."* Attachment 2 in the technical memorandum provides additional information on the depth to groundwater. However, there appears to be an inconsistency in the information. Specifically, the plan view provided in Figure A1 indicates depths to groundwater ranging from 11.51 feet below ground surface (bgs) (at P-1) to 14.42 feet bgs (at MW-1S). However, Figures A2 and A3 indicate lowest depth to groundwater of 13.5 feet bgs and 14.23 feet bgs, respectively.

- **EPA Comment 16** – *"The lead alternatives should be numbered and distinguishable from the PCE/TCE alternatives."* Although the technical memo does discuss PCE/TCE and lead separately within each alternative, separate alternatives should provide more flexibility in the selection of remedial alternatives for these two distinct contaminant groups.

- **NJDEP Comment 5b** – *"Table 1 includes a Federal Standard (EPA) for lead. The source of Federal Standards should be discussed in this section, as were the New Jersey Soil Cleanup Criteria (NJSCC), the Federal Standards should be discussed as well."* The technical memo indicates (on p. 6) that a list of Federal and State ARARs were analyzed to determine the cleanup criteria for the Site. The list of ARARs/TBCs analyzed in the technical memo should be provided.

307462

Specific Comments

1. P. 11, §5.2.4 – "GRP" should be "GRA."

2. P. 13, Table 2 – The purpose of this table is to screen technologies/process options for feasibility based on site conditions or contaminants. A clay and soil cap would be technically feasible. The screening comment would be more appropriate on Table 4.

3. P. 13, Table 2 – The difficulty of excavating inside the building should be discussed under excavation, rather than on-site incineration (and a number of other treatment technologies on Table 2). "Over kill" is not necessarily an appropriate rationale for eliminating on-site incineration. It would be more appropriate to eliminate this technology based on implementability and cost issues in the evaluation of technologies and process options presented in Table 4.

4. P. 14, Table 2 – The screening comment for biodegradation should also indicate that PCE/TCE do not readily degrade under aerobic conditions, as discussed under bioventing.

5. P. 20, §5.5 – The implementability evaluation should not discuss whether a technology/process option is "ineffective."

6. P. 20, §5.5.1 and P. 21, §5.5.2 – The lists of technologies/process options are not consistent, as process options are only provided under the treatment technology.

7. P. 22, Table 4 – The evaluation of excavation is not consistent. In Table 4, the difficulty of excavating beneath the buildings is discussed; however, the excavation alternatives developed later don't include discussion of excavation beneath the active buildings.

8. P. 22, Table 4 – For soil vapor extraction, steam injection, hot air injection, etc., it should be noted that the maintenance costs are only for a very short period of time, as these remedies are typically only implemented for a short duration, e.g., one to three years.

9. P. 24, Table 5 – Remedial technologies from Table 4 should be included in the remedial technology column on Table 5.

10. P. 24, Table 5 – The comparison in Table 5 should identify relative differences between technologies and process options. For example, asphalt and concrete caps may be more easily implemented than multi-media caps.

11. P. 24, Table 5 – The cost evaluation should differentiate hazardous and non-hazardous soil disposal.

12. P. 25, §5.6.1.3 – The No Action alternative will allow potential exposures to persist. It will not "expose humans and the environment...".

13. P. 26, §5.6.1.4 – Please clarify why the indicated data are needed for the No Action alternative. The current contaminant delineation is presumably adequate to define the Site conditions.

14. P. 26, §5.6.1.5 – No Action should be considered appropriate when there is a low potential for "exposure" rather than migration.

307463

15. P. 26, §5.6.1.7 – "GRA" should be "alternative."

16. P. 27, §5.6.2.4 – Please clarify why the indicated data are required for institutional controls.

17. P. 28, §5.6.3.3 – This section discusses caps in conjunction with vertical barriers. However, vertical barriers were screened from further consideration.

18. P. 29, §5.6.3.6 – This section indicates no excavation is required for capping, but the evaluation of multi-media capping in Table 5 indicates excavation would be performed.

19. P. 29, §5.6.4.1 – O&M of the facility may last for the life of the disposal facility, but this is not a concern for the entity disposing of the soil, nor does it result in any long-term costs.

20. P. 31, §5.6.5 – Please clarify why air injection to treat the saturated zone is discussed, since the saturated zone is being addressed by Alliant Techsystems, Inc. as discussed on Page 3.

21. P. 37, §5.6.7.1 – This section discusses addition of oxygen, but aerobic degradation is not a likely mechanism for the PCE/TCE.

22. P. 39, §5.6.8.1 – Is there specific relevance to remediation of dry cleaning facilities in the State of Florida?

23. P. 40, §5.6.8.3 – Are there any concerns with implementing in situ chemical oxidation beneath buildings, e.g., potential for generating toxic gases?

24. P. 40, §5.6.8.5 – This discussion is very general, and does not address site-specific conditions adequately, e.g., resistance of site-specific chemicals to oxidation.

25. P. 41, §5.6.8.7 – Chemical oxidation was eliminated based on the limitations presented in an earlier section; however, none of the limitations discussed appear to apply to this site to an extent that this technology could not be implemented.

26. P. 41, Tables 6 and 7 – A multi-media cap is not included on these tables, and was not previously eliminated from consideration.

27. P. 42, §6.1 – "They remedial alternatives..." should read "The remedial alternatives..."

28. P. 42, §6.1.1 – This heading is redundant.

29. P. 42, §6.1.1 – A multi-media cap was not eliminated from consideration, but is not included in the alternatives.

30. P. 44, §6.1.1.2 – The discussion of timeframe for this alternative should indicate that contaminants will remain for at least as long as under the No Action alternative, perhaps longer since infiltration will be reduced.

31. P. 45, §6.1.1.3 – "...limited amount of capital or operating and maintenance cost..." should be clarified. Also, the last sentence of this paragraph is not clear – cost would not be for "...continued operation and maintenance of TCE and PCE...".

32. P. 47, §6.1.1.4 – Under cost evaluation, the last sentence of this paragraph is not clear – cost would not be for "...continued operation and maintenance of TCE and PCE...".

33. Figure 3 – Note refers to results in bold, but boldface was not used.

34. Figure 4 – same as previous comment.

35. Figure 5 – It would be helpful to depict the locations of the building on the cross-sections. Also, the rationale for the elimination of sample SSAW-1 should be considered and discussed further. Excavation volumes and/or volumes to be treated could be substantially impacted if contamination extends deeper into the soil column.

36. Figure 6 – same as Comment 35, relative to sample SSSP-1.

37. Figure 9 - Note refers to results in bold, but boldface was not used.

38. Figure 9 – The lead results appear to indicate that contamination extends off-site. This was not discussed in the text. If the contamination extends off-site, consent from the off-site property owner is needed for a deed notice. This issue should be discussed as part of the implementability evaluation of the lead alternatives.

In accordance with Section VIII, paragraph 35 of the Administrative Order on Consent, an amended Technical Memorandum is due 30 days after receipt of this letter.

Should you have any questions or comments on any of the above, please contact Brian Quinn, of my staff, at 212-637-4381.

Sincerely yours,

Carole Petersen, Chief
New Jersey Remediation Branch

Enclosure

cc: David L. Isabel, Riker, Danzig, Scherer, Hyland & Perretti, w/encl.
Donna Gaffigan, NJDEP, w/encl.

307466

ATTACHMENT 2

DEPTH TO GROUND WATER INFORMATION

307467

TABLE 2

KLOCKNER & KLOCKNER

SHALLOW GROUND WATER ELEVATIONS *

Monitoring Well	Top of Casing (feet, MSL)	Ground Surface Elevation (feet, MSL)	10/4/89		9/11/90-9/14/90		9/24/90-9/27/90		10/8/90		10/9/90		10/10/90		11/16/90		12/20/90		1/16/91		Range (feet)	Fluctuation (feet)
			Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)		
MW-1S	524.09	524.48	511.59	12.89	511.79	12.69	-	-	510.77	13.71	510.74	13.74	510.71	13.77	510.69	13.79	511.23	13.25	511.59	12.89	12.69-13.79	1.10
MW-2S	525.97	523.81	512.57	11.24	511.77	12.04	-	-	511.42	12.39	511.39	12.42	511.37	12.44	511.29	12.52	511.47	12.34	511.82	10.99	10.99-12.52	1.53
MW-3S	525.39	523.94	512.01	11.93	510.99	12.95	-	-	511.46	12.48	511.41	12.53	511.40	12.54	511.30	12.64	511.51	12.43	511.83	12.11	11.93-12.95	1.02
MW-4S	523.31	523.68	-	-	511.81	11.87	-	-	511.43	12.25	511.69	11.99	511.85	11.83	511.43	12.25	511.93	11.75	512.53	11.15	11.15-12.25	1.10
MW-5S	523.38	523.87	-	-	511.96	11.91	-	-	511.40	12.47	511.40	12.47	511.37	12.50	511.29	12.58	511.51	12.36	511.86	12.01	11.91-12.58	0.67
MW-6S	522.99	523.26	-	-	511.99	11.27	-	-	511.40	11.86	511.37	11.89	511.36	11.90	511.29	11.97	511.52	11.74	511.84	11.42	11.27-11.97	0.70
MW-7S	523.56	524.05	-	-	511.86	12.19	-	-	511.37	12.68	511.34	12.71	511.32	12.73	511.22	12.83	511.43	12.62	511.77	12.58	12.19-12.83	0.64
FG-1	524.04	524.66	-	-	-	-	510.84	13.82	510.62	14.04	510.58	14.08	510.56	14.10	510.43	14.23	510.73	13.93	511.09	13.57	13.57-14.23	0.66

Key

MSL - Mean Sea Level

*Information from August 1991 *Feasibility Study, Rockaway Borough Well Field Site, Tables 1-1* and 1-2 by ICF Technology Incorporated

Note: Monitoring well FG-1 is located on the Building 13 property. All other wells listed are located on the Building 12 property.

TABLE 1

KLOCKNER & KLOCKNER

SHALLOW GROUND WATER ELEVATIONS MEASURED BY KLOCKNER'S CONSULTANTS

Monitoring Well	Top of Casing (feet, MSL)	Ground Surface Elevation (feet, MSL)	8/7/87		9/29/87		12/14/88		9/27/89		10/26/89		11/13/89		Range (feet)	Fluctuation (feet)
			Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)		
MW-1S	523.40	523.8	510.19	13.61	510.51	13.29	509.38	14.42	511.03	12.77	511.54	12.26	511.48	12.32	12.26-14.42	2.16
MW-2S	525.29	523.0	510.46	12.54	510.78	12.22	509.54	13.46	511.26	11.74	511.58	11.42	511.61	11.39	11.39-13.46	2.04
MW-3S	524.71	523.2	510.51	12.69	510.80	12.40	509.59	13.61	511.29	11.91	511.66	11.54	511.63	11.57	11.54-13.61	2.07
MW-4S	522.63	523.0	-	-	-	-	-	-	511.95	11.05	511.69	11.31	511.69	11.31	11.05-11.31	0.26
MW-5S	522.86	523.2	-	-	-	-	509.69	13.51	511.24	11.96	511.72	11.48	511.64	11.56	11.48-13.51	2.03
MW-6S	522.45	522.6	-	-	-	-	509.74	12.86	511.21	11.39	511.72	10.88	511.64	10.96	10.88-12.86	1.98
MW-7S	522.87	523.4	-	-	-	-	-	-	511.33	12.07	511.63	11.77	511.57	11.83	11.77-12.07	0.3
P-1	525.35	522.8	-	-	-	-	-	-	511.29	11.51	511.55	11.25	511.58	11.22	11.22-11.51	0.29

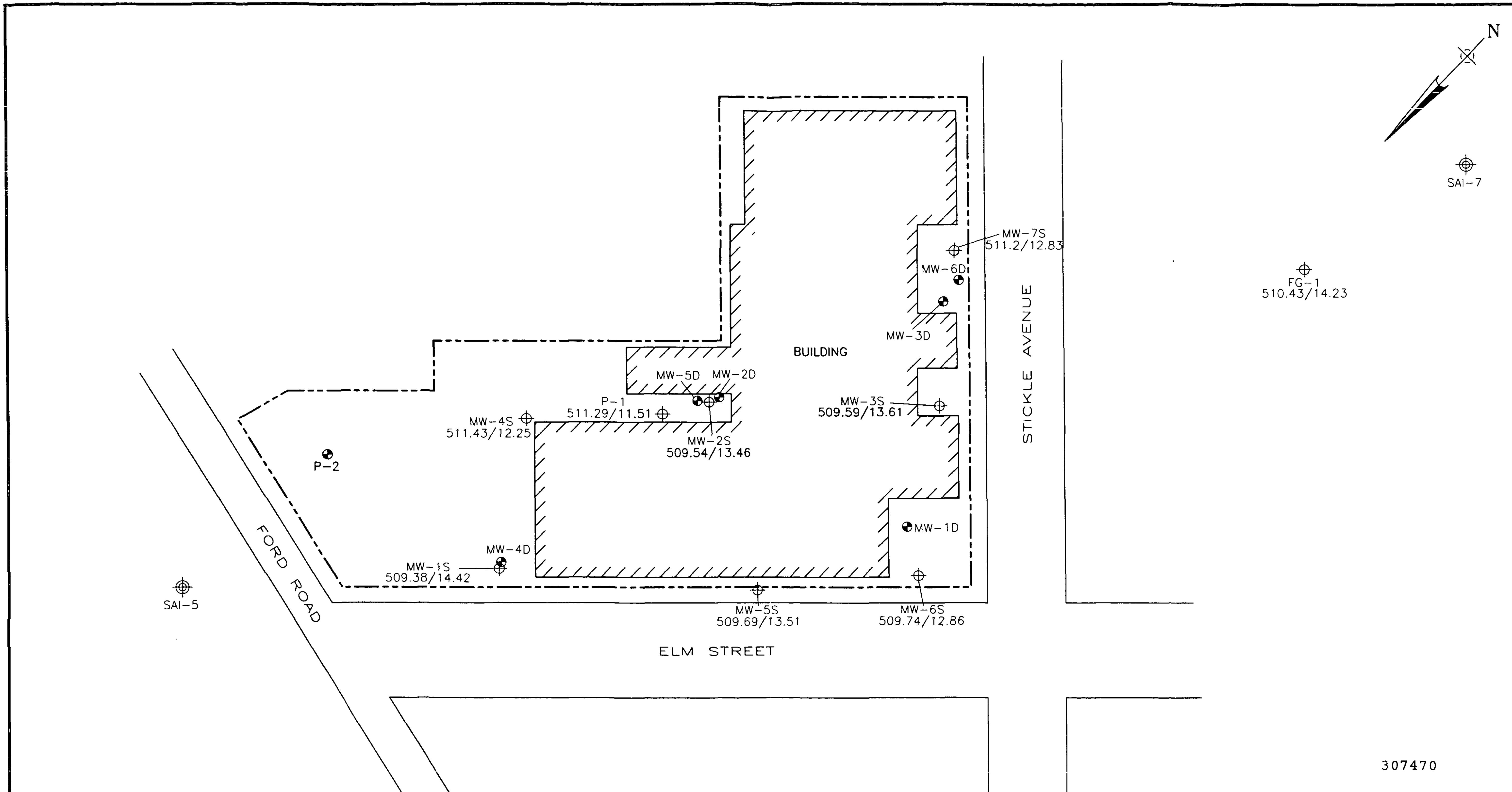
Key

MSL - Mean Sea Level

Note: All wells listed are located on the Building 12 property.

307469

F:\WPDOCS\MISC\950302.622



NOT TO SCALE

LEGEND

- PROPERTY BOUNDARY

MW-1S - SHALLOW MONITORING WELL LOCATION

MW-4D - DEEP MONITORING WELL LOCATION

SAI-5 - STATE WELL LOCATION

509.74/12.86 - GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL/ DEPTH TO GROUNDWATER FROM GRADE IN FEET-LOWEST ELEVATION/DEPTH ON OR BEFORE JANUARY 16, 1991

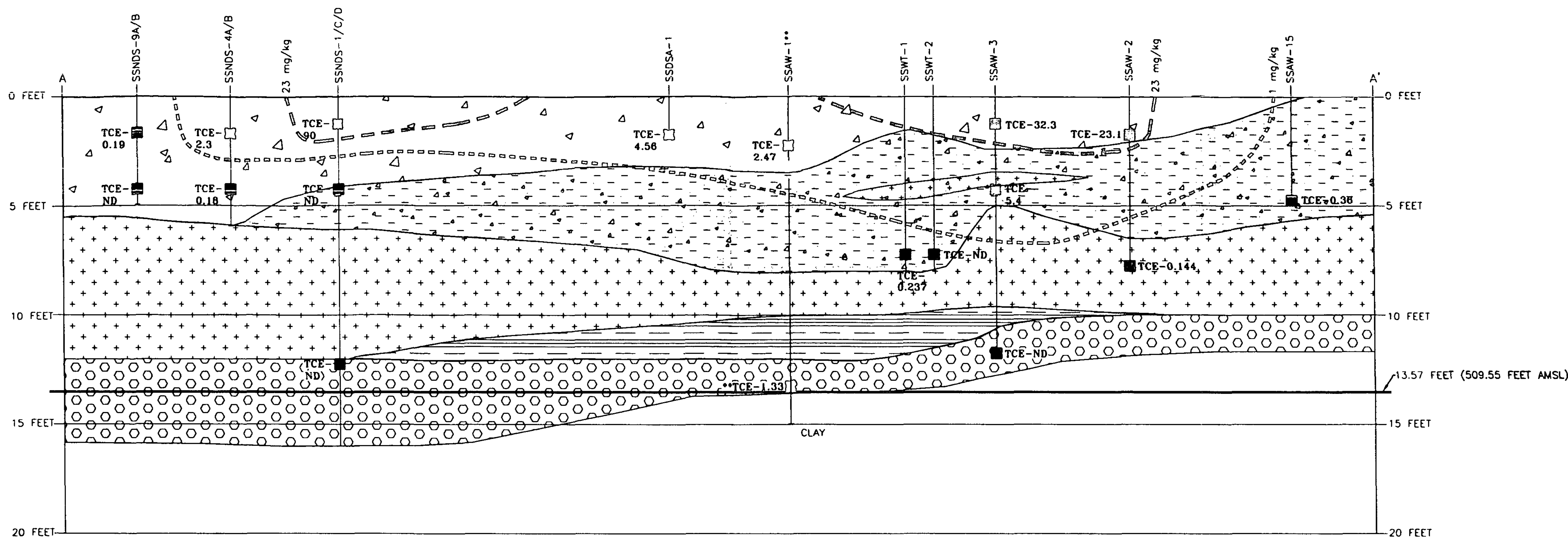
NOTES:
1) SITE MAP BASED ON PLAN BY FIRST ENVIRONMENT.
2) GROUNDWATER ELEVATIONS FOR MW-1S, MW-2S, MW-3S, MW-5S, AND MW-6S COLLECTED ON DECEMBER 14, 1988.
3) GROUNDWATER ELEVATIONS FOR MW-4S, MW-7S, FG-1, AND P-1 COLLECTED ON NOVEMBER 16, 1990.

THE WHITMAN CompanieS, INC.

KLOCKNER & KLOCKNER PROPERTY
ROCKAWAY BOROUGH
MORRIS COUNTY, NEW JERSEY

LOWEST DEPTH TO GROUNDWATER MEASURED ON OR BEFORE 1/16/91

ORIGINAL BY: E.C.	DRAWN BY: R.R.	DRAWING NO: 950302G1
CHECKED BY: E.C.	DATE: OCTOBER 2005	FIGURE NO: A1



LEGEND

SSAW-3 / TCE-32.3 – SOIL SAMPLE LOCATION WITH RESULTS IN mg/kg

TCE – TRICHLOROETHYLENE

ND – NOT DETECTED

TCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

TCE 23 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

** – THE TCE RESULT FOR SAMPLE SSAW-1 WAS NOT USED IN THE PREPARATION OF THE ISOCONCENTRATION LINES AS IT APPEARS TO BE AN ANOMALY. THE CONCENTRATION OF TCE DETECTED (1.33 mg/kg) WAS JUST ABOVE ITS REMEDIAL ACTION GOAL OF 1 mg/kg. THE RESULTS FOR SAMPLING IN THIS AREA INDICATE THAT THE TCE SOIL CONTAMINATION IS PRESENT ABOVE THE REMEDIAL ACTION GOAL IN THE SHALLOW (FIRST 5 TO 7 FEET OF SOIL BELOW GRADE) SOIL WHICH CONSISTS OF A SILTY SAND AND GRAVEL LAYER. OTHER DEEPER SAMPLE LOCATIONS IN THIS AREA INDICATED A SIGNIFICANT DROP OFF (1 TO 2 ORDERS OF MAGNITUDE OR TO NONE DETECTED) IN TCE CONCENTRATIONS WITH DEPTH. PRE-REMEDIATION SAMPLING WILL BE CONDUCTED FROM THIS AREA TO FURTHER INVESTIGATE THIS ANOMALY

– SILTY SAND AND GRAVEL

– SILTY FINE SAND

– SILTY CLAY WITH SAND AND SOME GRAVEL

– SILTY CLAY WITH SAND

– GRAVEL

AMSL – ABOVE MEAN SEA LEVEL

– AVERAGE LOWEST DEPTH TO GROUNDWATER MEASURED ON OR BEFORE JANUARY 16, 1991 IN FEET AMSL ON THE BUILDING 12 PROPERTY (AVERAGE OF LOWEST READINGS AT MW-1S, MW-2S, MW-3S, MW-5S, AND MW-6S WHICH RANGE FROM 509.38 TO 509.74 FEET AMSL.) ACTUAL DEPTH TO GROUNDWATER BELOW GRADE VARIES DUE TO TOPOGRAPHIC RELIEF (I.E. 14.43 FEET AT MW-1S, 13.46 FEET AT MW-2S). SEE FIGURE A1 FOR MONITORING WELL LOCATIONS.

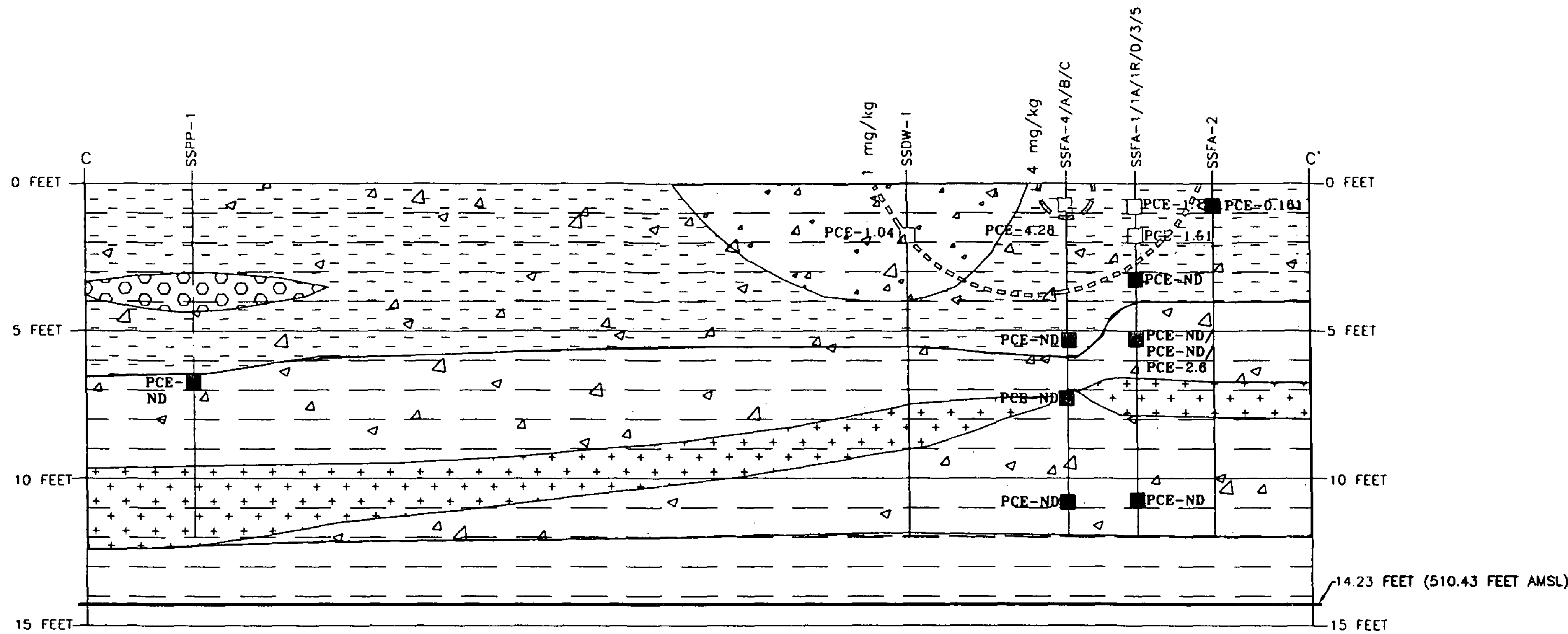
NOTE: SEE FIGURE 3 FOR CROSS SECTION LOCATION

307471

0 20'
HORIZONTAL SCALE

0 5'
VERTICAL SCALE

THE WHITMAN CompanieS, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NEW JERSEY CROSS-SECTION OF LOWEST DEPTH TO GROUNDWATER MEASURED ON OR BEFORE 1/16/91 BUILDING 12	
ORIGINAL BY: M.M.	DRAWN BY: R.R.	DRAWING NO: 950302G8
CHECKED BY: M.M.	DATE: APRIL 2006	FIGURE NO: A2



307472

0 20'
HORIZONTAL SCALE

0 5'
VERTICAL SCALE

LEGEND

SSFA-2 PCE-0.161 – SOIL SAMPLE LOCATION WITH RESULTS IN mg/kg

PCE – TETRACHLOROETHYLENE

ND – NOT DETECTED

PCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE 4 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE-4.28 – PCE CONCENTRATION AT OR ABOVE 4 mg/kg

PCE-1.51 – PCE CONCENTRATION ABOVE 1 mg/kg

– SILTY SAND AND GRAVEL

– SILTY FINE SAND

– SILTY CLAY WITH SAND AND SOME GRAVEL

– GRAVEL

AMSL – ABOVE MEAN SEA LEVEL

– LOWEST DEPTH TO GROUNDWATER MEASURED ON OR BEFORE JANUARY 16, 1991 IN MONITORING WELL FG-1 LOCATED ON THE BUILDING 13 PROPERTY

NOTE: SEE FIGURE 7 FOR CROSS SECTION LOCATION

THE WHITMAN Companies, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NEW JERSEY CROSS-SECTION OF LOWEST DEPTH TO GROUNDWATER MEASURED ON OR BEFORE 1/16/91 BUILDING 13	
ORIGINAL BY: M.M.	DRAWN BY: R.R.	DRAWING NO: 950302G7
CHECKED BY: M.M.	DATE: APRIL 2006	FIGURE NO: A3

3

307473

ATTACHMENT 3

LIST OF ARARS

307474

ATTACHMENT 3

KLOCKNER PROPERTY
LISTING OF POTENTIAL
FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

ACTION-SPECIFIC	RATIONALE
Hazardous Waste Requirements (RCRA Subtitle C, 40 CFR, Part 264)	Standards applicable to treating, storing and disposing of hazardous waste
Safe Drinking Water Act	
- Underground Injection Control Regulations (40 CFR, Parts 144, 145, 146, and 147)	May be applicable to on-site ground water recirculation systems
Clean Water Act	
- NPDES permit	Contamination pattern or remedial alternative may include discharge to surface waters
Clean Air Act	
- Public health basis to list pollutants as hazardous under Section 112 of the Clean Air Act	Remedial alternatives may include volatilization technologies
OSHA Requirements (29 CFR, Parts 1910, 1926, and 1904)	Required for workers engaged in on site remedial activities
DOT Rules for Hazardous Materials Transport (49 CFR, Parts 107, 171.1-171.500)	Remedial alternatives may include off-site treatment and disposal
EPA's Ground Water Protection Strategy	Remedial alternatives must consider EPA classification of ground water conditions at the site
New Jersey's Technical Requirements for Site Remediation (N.J.A.C. 7:26E)	Regulations constituting the minimum technical requirements to investigate and remediate contaminated sites
New Jersey Solid Waste Management Act (N.J.S.A. 13:1-E et seq.) New Jersey Solid Waste Management Regulations (N.J.A.C. 7:26-1 et seq.) Closure and Post-Closure Requirements (N.J.A.C. 7:26-9)	Apply to long-term monitoring of site conditions and handling and disposal of wastes.

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TABLE 32 (Continued)

KLOCKNER PROPERTY
LISTING OF POTENTIAL
FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

ACTION-SPECIFIC (Continued)	RATIONALE
New Jersey Air Pollution Control Act (N.J.S.A. 26:2C-1 et seq.) NJ Air Pollution Control Regulations (N.J.A.C. 7:27-1 et seq.)	Must be evaluated as soil vapor extraction is a potential remedial alternative.
New Jersey Safe Drinking water Act (N.J.S.A. 58:12A-1 et seq.) New Jersey Safe Drinking Water Regulations (N.J.A.C. 7:10-1 et seq.)	May be applicable to on-site ground water recirculation systems.
New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) NJPDES Discharge to Ground Water or Surface Water Permit Conditions (N.J.A.C. 7:14A) NJ Ground Water Quality Standards (N.J.A.C. 7:9-6) New Jersey Surface Water Quality Standard (N.J.A.C. 7:9B-1 et seq.)	Apply to discharge of treated water.
Soil Erosion and Sediment Control Plan (N.J.A.C. 13:27)	Apply to remedial alternatives including disturbance of more than 5,000 square feet of surface area.
New Jersey's Industrial Site Recovery Act Regulations (N.J.A.C. 7:26B)	Requirements concerning remediation of industrial establishments, allows use of engineering and/or institutional controls.
New Jersey Freshwater Wetlands Protection Act, (N.J.S.A. 13:9B-1 et seq.) NJ Freshwater Wetlands Protection Regulations (N.J.A.C. 7:7A-1 et seq.)	Requirements concerning disturbance of freshwater wetlands.

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ATTACHMENT 3 (continued)

KLOCKNER PROPERTY
LISTING OF POTENTIAL
FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

CONTAMINANT-SPECIFIC	RATIONALE
Safe Drinking Water Act New Jersey Safe Drinking Water Act (N.J.S.A. 58:12A-1 et seq.) NJ Safe Drinking Water Regulations (N.J.A.C. 7:10-1 et seq.)	Remedial actions may provide clean up to the Maximum Contaminant Levels (MCLs)
	Maximum Contaminant Level Goals (MCLGs) are promulgated Federal criteria and include VOCs. New Jersey criteria may be more stringent.
Health Advisories, EPA Office of Drinking Water	RI activities identified presence of chemicals for which health advisories are listed
Clean Water Act (PL92-500); Federal Water Quality Criteria (FWQC)	Contamination pattern or remedial alternative may include discharge to surface waters
Clean Air Act (42 USC 7401); National Ambient Air Quality Standards (NAAQS) for six criteria pollutants (40 CFR Part 50) New Jersey Air Pollution Control Act (N.J.S.A. 26:2C-1 et seq.) NJ Air Pollution Control Regulations (N.J.A.C. 7:27-1 et seq.)	Remedial alternatives may include volatilization technologies
Water Quality Regulations Title 6, Chapter X, Parts 700-705	Provides surface water and groundwater classifications and standards
New Jersey Water Pollution Control Act (58:10A-1 et seq.) NJPDES Discharge to Surface Water or Ground Water Permit Conditions (N.J.A.C. 7:14A et seq.) NJ Ground Water Quality Standards (N.J.A.C. 7:9-b) NJ Surface Water Quality Standards (N.J.A.C. 7:9B-1 et seq.)	Remedial action may require cleanup to state standards if they are more stringent than federal

307477

ATTACHMENT 3 (continued)

KLOCKNER PROPERTY
LISTING OF POTENTIAL
FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

CONTAMINANT-SPECIFIC (Continued)	RATIONALE
New Jersey Hazardous Discharge Site Remediation Act (N.J.S.A. 58:10B-12d)	Remedial alternatives may address soil treatment.
- Classes and quality standards for ground water	State of New Jersey requires protection of ground water for use as potable water and cleanup to these standards.
- Effluent standards and/or limitations for discharge to ground water	Remedial alternatives may impact ground water on site.
- Surface Water Standards and Criteria	Remedial alternatives may impact surface water.
NJDEP Soil Cleanup Objectives*	Remedial alternatives may address soil treatment.

* This is a guidance criteria "to be considered" (TBC).

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ATTACHMENT 3 (continued)
THE KLOCKNER PROPERTY
LISTING OF POTENTIAL
FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

LOCATION-SPECIFIC	RATIONALE
Rivers and Harbors Act of 1899 33 CFR Parts 320-327	Remedial alternatives at site may affect the Rockaway River
Roe Amendment, Water Quality Act of 1987, Section 318, CFR, January 24, 1989 pages 2946-2948, and Superfund Amendments and Reauthorization Act of 1986 (Section 118 (c))	The site lies within the Unconsolidated Quaternary Sole Source Aquifer. These regulations prevent locating surface water impoundments, waste piles, or land treatment facilities over such an aquifer or zone.
Executive Orders 11988 (Floodplain Management) and 11990 (Protection of wetlands)	Both floodplain and wetland resources may be affected by the site remedial alternatives.
Endangered Species Act of 1978 (16 USC 1531)	Considered in the public health and environmental assessment.
Fish & Wildlife Coordination Act (16 USC 661)	Remedial alternatives may affect wetlands and protected habitats.
Fish & Wildlife Improvement Act of 1978 (16 USC 742)	Remedial alternatives may affect wetlands and protected habitats.
Fish & Wildlife Conservation Act of 1980 (14 USC 2901)	Remedial alternatives may affect wetlands and protected habitats.
New Jersey Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 et seq.) NJ Freshwater Protection Regulations (N.J.A.C. 7:7A-1 et seq.)	Remedial alternatives may affect wetlands and protected habitats.
National Historic Preservation Act (NHPA)	The project area may be sensitive for the discovery of cultural resources.
New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) NJ Ground Water Quality Standards (N.J.A.C. 7:9-6) NJ Surface Water Quality Standards (N.J.A.C. 7:9B-1 et seq.)	Remedial action may require cleanup to state standards if they are more stringent than Federal.
- Classes and Standards for Surface Waters	These standards are applicable to classes of water near the site.
New Jersey Flood Hazard Area Control Act (N.J.S.A 58:16A-50 et seq.)	Floodplain resources maybe affected by the site remedial alternatives.
New Jersey Flood Hazard Area Control Regulations (N.J.A.C. 7:13 et seq.)	

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